Roinn Tailte

(Department of Lands)

FO-ROINN IASCAIGH

(Fisheries Division)

REPORT

ON THE

SEA AND INLAND FISHERIES

FOR THE YEAR

1957,

incorporating Statistics of the Capture of Salmon, Sea Trout and Eels, and certain scientific papers relating to fisheries.

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PUBLISHED BY THE STATIONERY OFFICE.

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NOTE :—Sea fish are divided into two categories, pelagic and demersal. The term "pelagic" (Greek: "pelagos", the sea) is applied to those fish which usually swim at or near the surface of the water. The main varieties of pelagic fish landed are herrings, mackerel and sprats. The term "demersal" (Latin: "Demergere", to plunge down) is applied to those fish which live during adult life at or near the sea bottom. The chief species landed are turbot, brill, soles, plaice, cod, haddock, hake, ling, whiting, conger eel and ray (skate). Shellfish consist of two classes, viz., molluscs, of which the main varieties gathered are oysters, mussels, escallops, periwinkles and cockles, and crustaceans—lobsters, crawfish, crabs, shrimps and prawns.

REPORT

OF THE

MINISTER FOR LANDS

ON THE

SEA AND INLAND FISHERIES

FOR THE YEAR

1957.

PART I.

SEA FISHERIES.

The landings of sea fish have been increasing progressively in recent years and in 1957 the upward trend in quantity and value has continued. The total value of all varieties was £1,147,087 as against £1,020,794 in 1956. The quantity of wet fish landed was 532,475 cwt., valued at £907,119, representing an increase of 155,108 cwt., and £119,959, over 1956. The value of shellfish taken increased to £239,968 compared with £233,634 in the previous year. An overall weight for shellfish is not ascertained as returns show some varieties by count instead of weight. The weight and value of the landings of all sea fish (excluding shellfish) since 1948 were as follows :—

TABLE I.

Year		Cwt.	£
1957	...	532,475	907,119
1956	...	377,367	787,160
1955	...	303,519	686,195
1954	...	254,714	635,802
1953	...	222,516	545,105
1952	...	203,000	478,774
1951	...	187,645	431,875
1950	...	214,236	442,309
1949	...	234,674	507,342
1948	...	385,243	595,647

Particulars of the varieties landed in 1957 are to be found in Appendix 1 and the average prices of the varieties for a number of years are shown in Appendix 2. The fishing operations were interrupted for short spells through the year but on the whole the fishermen were not unduly handicapped by bad weather. When landings were inadequate to meet consumers demand, occasional imports of fish were permitted. The total quantity of imports amounted to some 4,000 cwt. valued at £19,000. The varieties were mainly plaice, cod and herring.

In order of value of fish landed, the principal ports in 1957 were Killybegs, Dunmore East, Howth, Dingle, Galway, Dublin and Clogherhead. Dunmore East owes its position largely to the revival of the herring fishery in that area.

DEMERSAL FISHERY.—An increase of 34,234 cwt. in the demersal fish intake is recorded for the year, representing a value of £32,683 more than in 1956. The total of demersal fish landed was 259,722 cwt. which realised £693,330 to the fishermen. Nearly all the varieties recorded shared in the increase both in quantity and value, the exceptions being brill and plaice which declined under both heads and whiting which, though increased in quantity, was reduced in value. Unit prices for most varieties fell. The sustained demand, however, for the prime varieties is reflected in the increased prices for brill, soles and plaice, though turbot shows a lower unit return than in the previous year. The price reductions in the case of the others can no doubt be accounted for by the increased landings and, in regard to whiting, was accentuated by the purchase, as in the previous year, of this fish for industrial purposes. The following table gives the weight, value and average price per cwt. of demersal fish each year since 1948.

TABLE 2.

Year	Cwt.	£	Average value per cwt.
			s. d.
1957 ...	259,722	693,330	53 5
1956 ...	225,488	660,647	58 7
1955 ...	193,016	593,190	61 [illegible]
1954 ...	169,926	540,690	63 7
1953 ...	147,757	451,901	61 2
1952 ...	134,841	397,276	58 11
1951 ...	119,055	354,536	59 7
1950 ...	119,645	364,702	61 0
1949 ...	151,537	416,275	54 11
1948 ...	152,567	423,436	55 6

PELAGIC FISHERY.—*Herrings :* The herring fishery which has shown signs of recovery for some years past made a notable advance in 1957 and the quantity taken was 233,365 cwt.

compared with 137,849 cwt. in 1956, which, in turn, had been an appreciable improvement from the average of a number of previous years. The 1957 value was £173,027 as against £101,608 in 1956. Despite the increased volume of these landings the average price per cwt. worked out at a figure a little higher than in 1956 (14s. 10d. as compared with 14s. 9d.). The herring fisheries at present being exploited are mainly in the waters off the Donegal Coast and off Dunmore East, County Waterford. There were increased takings in both sectors during the 1957 season, those off Donegal being about 50% higher than in 1956 and those off Dunmore East approaching 100% greater. The herring run off Dunmore East has in recent years attracted boats from various European countries and in the winter season beginning about October, 1957, German boats joined the fleets from other countries which had already discovered the value of the fishery. Of the Irish group of boats which participated, some came from Killybegs, County Donegal, and others from Howth, Arklow and other eastern ports while further contingents arrived from Schull and other south coast ports. A ready market was available for all catches, the outlet in Great Britain being particularly open owing to the lean season which had been experienced by British boats in the North Sea Herring Fisheries. This trade was assisted by the introduction of a bulk transport scheme for exports from Dunmore East to Billingsgate market. While the bulk of the catches were sold for freshing, some went for curing at Burtonport, Gortnasate and Killybegs, Co. Donegal, and at Dunmore East. The cured product found markets on the Continent mainly. The table hereunder sets out particulars of landings of herrings since 1948 : Appendix 4 lists the principal herring ports during 1957 and gives quantities and values of landings for each county.

TABLE 3.

Year	Cwt.	£	Average value per cwt.
			s. d.
1957 ...	233,365	173,027	14 10
1956 ...	137,849	101,608	14 [illegible]
1955 ...	96,560	73,782	15 3
1954 ...	68,322	72,848	21 4
1953 ...	58,981	70,066	23 9
1952 ...	54,947	60,451	22 0
1951 ...	49,823	56,830	22 10
1950 ...	67,840	55,438	16 4
1949 ...	45,300	49,438	21 10
1948 ...	73,050	73,828	20 3

MACKEREL.—Mackerel landings in 1957 increased to 22,913 cwts. valued at £36,209 as compared with 13,850 cwts. valued at £24,815 in 1956. The fishing for this variety was carried on, mainly by small craft, off the south coast where over 18,000 cwts. of the total quantity were caught. Baltimore and Schull, County Cork, and Valentia and Dingle, County Kerry, are the centres where this fishing may be said to be usually concentrated in any degree. The two County Cork ports accounted for the greatest individual landings by ports during the year: the Co. Kerry ports did not fare well. The catches off the north coast, which is the next sector in order of importance, declined compared with the previous year. The quantity, value and average unit price for the past 10 years are given hereunder:—

TABLE 4.

Year	Cwt.	£	Average value per cwt.
			s. d.
1957 ...	22,913	30,209	31 7
1956 ...	13,850	24,815	35 10
1955 ...	11,563	18,913	32 9
1954 ...	14,766	21,967	29 9
1953 ...	15,374	22,976	29 11
1952 ...	13,018	20,967	32 3
1951 ...	17,017	19,959	23 5
1950 ...	19,838	20,399	20 7
1949 ...	27,220	38,399	28 3
1948 ...	150,076	95,673	12 9

SHELLFISH.—The figures appearing opposite the varieties of shellfish at Appendix 1 give a total value of takings of £239,968 which is some £6,000 greater than in 1956. The principal takings as usual were of lobsters, periwinkles and crawfish, though Norway lobsters have come to the forefront in the past few years and are now attaining a position almost comparable to the three chief species. Lobster and crawfish fishing has shown a tendency to become better organised latterly and periwinkle picking too is on a more regular basis. These varieties, of course, are intended primarily for export, Great Britain being the main outlet for lobster while France takes most of the crawfish and periwinkles. Norway lobsters are processed for sale in Great Britain and elsewhere abroad. The catching of shellfish is a valuable addition to the income of many occupiers of small farms around the sea coast who engage in it when land operations permit while at the same time it may be a profitable fishery for

the more regular fishermen on a short term basis. The value of shellfish landings since 1948 was as follows:—

TABLE 5.

	£
1957 ...	239,968
1956 ...	233,634
1955 ...	196,103
1954 ...	154,525
1953 ...	142,554
1952 ...	124,196
1951 ...	93,604
1950 ...	87,119
1949 ...	108,487
1948 ...	100,466

PERSONNEL AND VESSELS.—The numbers engaged wholetime at fishing in 1957 were greater than in the preceding year: the figures were 1,613 as against 1,584. On the other hand, those partially engaged were fewer than in 1956—4,499 as against 4,852. The growth in the numbers engaged wholetime is in accordance with the increase in the numbers of larger vessels now being issued and this tendency may be expected to recur in future years. As an indication of the replacement by larger power vessels of lesser craft it may be cited that, in 1957, 133 vessels 25 tons gross and over were employed compared with 114 of the same class in 1956, while the figure for motor vessels less than 15 tons gross, regarded as second class, was 296 in 1957 as against 313 the previous year. The trend towards decline appears also in the case of sail boats and rowboats. Full particulars of all men and craft engaged in the fishing industry are set out in Appendix 6.

AN BORD IASCAIGH MHARA.—A synopsis of the Board's operations during the twelve months ended 31st March, 1957, as recorded in its 5th Annual Report and financial accounts, is given in the following paragraphs.

Five 50 foot and four 56½ foot boats were completed at the Board's boatyards during the year and one 60 foot, one 56½ foot and one 55 foot boats were delivered by other builders to the Board's order. Ten new boats were issued on hire purchase. Issues of boats and gear on hire purchase, credit or cash sales were valued at £156,645. The number of motor fishing vessels the subjects of hire purchase transactions at 31st March, 1957, was 104, valued at £430,000 (approx.).

In accordance with the Scheme for the provision of fishing boats in the Fíor-Ghaeltacht, two 56½ foot boats were put in commission, a third was ready for service and a fourth was nearing completion at the close of the year.

The quantity and value of fresh sea fish (excluding shellfish and imported white fish) handled by the Board during the year was 182,742 cwts. valued at £527,605 an increase of 25,214 cwts. in quantity and £19,372 in value over the previous year's figures. The Board arranged shipment of a cargo of 1,000 crans of Klondyke herring from Killybegs to Germany and satisfactorily disposed of 438 barrels of cured herring fillets on the Continent.

The operation of the Board's three offshore vessels resulted in a loss of £8,040 as compared with £11,220 in the previous year. The loss, consisting largely of overhead charges, was attributable to two of the vessels which were laid up.

Production of frozen fish, smoked fish, fish meal and fish oil was continued at the Killybegs factory. A loss of £4,833 was sustained as compared with £5,135 in the previous year. A large part of the loss was attributable to the pilot fish-meal plant which is not designed to work on an economic scale.

During the year the Board received a grant of some £32,000 from the Exchequer in aid of administration. There was a slight profit on fish marketing—£514 on sales exceeding £500,000—for set off against the losses mentioned above leaving a net loss of £13,259 on Fish Revenue Account (£14,850 in previous year). Administration charges and general development expenses not covered by grants brought this loss to £14,481 (£15,798 in previous year).

The Boatbuilding Account and Boats and Gear General Revenue Account showed small profits but, on charging a reserve of £9,000 against losses on resumption of possession, there was a net loss of £8,084 (£6,937 in previous year).

Grants totalling £43,775 were received by the Board during the year for capital development purposes (£30,000 from the Fisheries Vote and £13,775 from the National Development Fund—excluding the Fior-Ghaeltacht Boat Scheme). Advances repayable by the Board to the Central Fund increased during the year by £58,676 for capital works and £89,556 for boats and gear.

SEA FISHERIES PROTECTION.—In the course of its patrols carried out regularly over the exclusive fishery limits of the State the Naval Service of the Department of Defence detected seven infringements which led to the apprehension and prosecution of the offenders. Convictions were secured in all cases except one where it was held that the measurements were not sufficiently clearly defined.

Under domestic bye-laws one detection was made in a case where an oyster infringement occurred and a prosecution was recommended.

Inspection of fishing nets to ascertain whether any containing illegal meshes were being used was continued through the year while catches and consignments of fish were also examined to detect under-sized specimens.

SCIENTIFIC INVESTIGATIONS (MARINE).—During 1957 samples of escallops from the three most important Connemara beds were examined in order to determine the growth rates in these three areas. A short paper on this subject was being prepared at the close of the period under review. A survey of the mussel beds along parts of the coast of County Cork was also made with a view to assessing the commercial possibilities of the area for these shellfish.

The experiments on oysters in Clew Bay were continued. There was evidence that spawning was moderately successful during 1957 and there are indications also of fair numbers of small oysters from the 1956 brood. These suggest that a stock of oysters is gradually being built up in this area but it is too early as yet to open the bed to commercial fishing. The experiments are to be continued for a further period.

Investigations were started in 1957 into the stocks of lobsters around the Irish coasts. In June, 197 lobsters were tagged and released alive around Dalkey Island, County Dublin, where there is a small lobster fishery which because of its sheltered character is carried on all the year round. By the end of the year 58 tags had been recovered, representing 29.4% of the fish tagged. No substantial movement of lobsters outside the small area of fishing operations was detected. In addition, by courtesy of the fishermen, large numbers of lobsters taken in the Dalkey fishery were measured, sexed, etc., just before being offered for sale in the Dublin Wholesale Fish Market and catch effort returns were also kindly provided by some of the Dalkey fishermen. In this way it has been possible to build up a good picture of this small lobster fishery. The investigations are to continue.

Tagging of lobsters along the Kerry coast was also carried out in 1957. In all 554 lobsters were tagged and released alive in August, 1957, along the stretch of coastline from the entrance to Kenmare Bay to Smerwick Harbour. Returns of tags were, however, very disappointing due to the fact that immediately after tagging and release of the lobsters in late August, a very prolonged spell of bad weather prevented fishing and a similar spell of unfavourable weather at the beginning of the 1958 season prevented lobster boats from operating satisfactorily. Only three tagged lobsters were recorded as having been recaptured during 1957.

The size, distribution, sex ratio, state of sexual maturity, presence of parasites, etc. were recorded for large numbers of lobsters from the coasts of Counties Wexford, Waterford, Cork and Kerry. This material will be of great value in assessing the intensity of fishing for lobsters around the Irish coasts at a later date. The size of lobster captured in relation to the type of pot or creel used was also investigated and by the courtesy of some fishermen in the Dublin, Kerry and Galway areas fishing effort and catch statistics were compiled. Pond storage conditions for lobsters were investigated in the summer of 1957 at places on the coasts of Cork and Kerry.

During the year a number of fishes rare or scarce in Irish waters were recorded. A specimen of the Pilot-fish (*Naucrates ductor*, L.) was taken off Clogherhead, Co. Louth, on 13th August, 1957. This species has been rarely recorded previously from Irish waters. A specimen of the Greater Forkbeard (*Urophycis blennoides*, Brunn.) was taken off Dunmore East, Co. Waterford, on 9th April, 1957. This is also a rather rare fish around the Irish coasts. A fine specimen of the Torpedo (*Torpedo nobiliana*, Bonap.) was landed off Clogherhead, Co. Louth, on 17th September, 1957. This species has been recorded on a number of occasions from Irish waters and it may be much more common than records of its occurrence would lead us to believe. A specimen of Ray's bream (*Brama raii*, Bloch.) was taken in a mackerel net 3 miles west of Smerwick Harbour, Co. Kerry, on 20th September, 1957. This species has been recorded on a number of occasions in recent years, and it is likely that there may be a regular, albeit small, migration towards Ireland each year. Only two other species need be mentioned, namely the Greater Weever (*Trachinus draco*, L.) and the Sting ray (*Trygon pastinaca*, L.). The former species was recorded from the Irish Sea near Dún Laoghaire, Co. Dublin, Dunmore East, Co. Waterford, and Castletownshend, Co. Cork, while the latter was recorded from Dingle, Co. Kerry and Dunmore East. Both of these species are probably scarce rather than rare as specimens have now come to hand at frequent intervals over some periods.

INTERNATIONAL AND OTHER CONFERENCES.

(1) International Council for the Exploration of the Sea.—The Inspector and Scientific Adviser attended the annual conference of the International Council for the Exploration of the Sea at Bergen, Norway from 30th September until 6th October, 1957, and gave an account of the captures of rare fishes in Irish waters and of the salmon movements along the Donegal coast. Proceedings at the Salmon and Trout, Atlantic Slope and Statistical Committees were of particular interest to this country. The Department's representative completed his term of office as Chairman of the Salmon and Trout Committee and was subsequently elected Chairman of the Consultative Committee, which comprises the Chairmen of all the other Committees of the Council. Chairmanship of the Consultative Committee carries with it Chairmanship of the Liaison Committee established by the Council to provide scientific information to the Permanent Commission set up by the International Fisheries Convention of 1946. The Department's representative also attended an informal conference held under the auspices of the Council in London in January, 1957, to discuss a programme of research on the lobster stocks jointly exploited by British, French and Irish boats. As a result of this conference a programme was formulated,

(2) Permanent Commission of the International Fisheries Convention of 1946.—This Commission held a meeting in London in October, 1957, which was attended by officers of the Department, who also took part afterwards in an informal discussion of suggestions for revision of the Convention. Although considerable progress was made, the calling of a formal meeting to deal with this matter was deferred pending the international conference on the Law of the Sea at Geneva in the spring of 1958 under the auspices of United Nations Organisation.

(3) Fishing Gear Congress.—This congress, which was organised by F.A.O. in Hamburg, Germany, in October, 1957, was attended by two officers of the Department and by a fishing skipper and a designer of fishing boats.

(4) Challenger Society.—This Society was founded to promote the study of oceanography and it holds joint meetings with marine and other research laboratories from time to time. The Department's Inspector and Scientific Adviser attended its meeting in London in January, 1957, when some of the papers were devoted to problems relating to pollution of natural waters and a visit was paid to the Water Pollution Laboratory of the British Department of Scientific and Industrial Research at Stevenage, Hertfordshire.

(5) Fishery Population Studies Course.—An officer of the Department took part in the course on Fishery Population Studies at the Fisheries Experiments Station, Lowestoft, Suffolk, England, in February and March, 1957. This course was attended by representatives of most Western European countries. It was organised by the British Ministry of Agriculture, Fisheries and Food and the Scottish Home Department, conjointly with F.A.O., at the suggestion of the Permanent Commission of the International Fisheries Convention of 1946 and with the full agreement of the International Council for the Exploration of the Sea.

TECHNICAL ASSISTANCE.—As part of the Fisheries Technical Assistance Programme a harbours consultant of international repute was, on the recommendation of F.A.O., engaged for the purposes of advising as to the selection and development of a small number of centres as major fishery harbours. The expert paid a preliminary visit to this country early in December, 1957, as a result of which the necessary further steps for the carrying out of the assignment were taken. Other technical assistance projects undertaken in 1957 included (1) a visit by an officer of the Department and an officer of An Bord Iascaigh Mhara to major British fishing ports to study operation costings and catch effort performance of certain types of fishing vessel and (2) representation at the Fishing Gear

Congress held in Hamburg in October, 1957, to which reference has already been made.

MARINE WORKS.—The Department, as usual, collaborated with other Departments and local authorities in advising on the need, in the fishery interests, for the provision or improvement of marine facilities in cases where financial assistance from the State was required.

PART II.

INLAND FISHERIES.

EXTENT OF FISHERY DISTRICTS AND NAMES OF THE PRINCIPAL RIVERS IN EACH DISTRICT.

District	Extent of District	Principal Rivers
No. 1 Dublin	Most easterly point on Red Island, Skerries, to Wicklow Head.	Liffey Vartry.
No. 2 Wexford	Wicklow Head to Kiln Bay, east of Bannow Bay, Co. Wexford.	Slaney Avoca
No. 3 Waterford	Kiln Bay, east of Bannow Bay to Helvick Head, Co. Waterford.	Suir Barrow Nore.
No. 4 Lismore	Helvick Head to Ballycotton Pier, Co. Cork.	Blackwater, Funshion, Bride, Awbeg.
No. 5 Cork	Ballycotton Pier to Crow Head, Co. Cork.	Lee, Owenboy, Bandon, Argideen, Ilen, Mealagh, Owvane, Coomhola, Glengarriff, Adrigole.
No. 7 Kerry	Crow Head, Co. Cork, to Kerry Head, Co. Kerry.	Roughty, Sheen, Finnihy, Blackwater, Sneem, Laune, Flesk, Maine, Caragh, Currane, Cummeragh, Inny.
No. 8 Limerick	Kerry Head, Co. Kerry, to Hag's Head, Co. Clare.	Shannon, Deel, Fergus, Mulcair, Little and Upper Brosna, Inny, Maigue, Feale.
No. 9[1] Galway	Hag's Head to the sea point of the boundary between the townlands of Keeraunagark South and Bunraghbaun South, Co. Galway.	Corrib, Claregalway.
No. 9[2] Connemara	The sea point of the boundary between the townlands of Keeraunagark South and Bunraghbaun South, Co. Galway to Slyne Head Co. Galway.	Ballindhinch, [illegible], Cushla, Owengowla, Invermore, Inverbeg, Screebe, Furnace.
No. 10[1] Ballinakill	Slyne Head to Pigeon Point, Westport Bay, Co. Mayo.	Culfin, Erriff, Bundorragha, Dawros, Carrowniskey, Bunowen (Louisburgh).
No. 10[2] Bangor	Pigeon Point to Benwee Head, Co. Mayo.	Newport, Burrishoole, Owenduff, Owengarve, Owenmore, Glenamoy.

District	Extent of District	Principal Rivers
No. 11 Ballina	Benwee Head to Coonamore Point, Co. Sligo.	Moy, Cloonaghmore (Palmerston), Easkey.
No. 12 Sligo	Coonamore Point to Carrickgarve, Co. Sligo.	Ballisodare, Garavogue (Sligo), Bonet, Drumcliff.
No. 13 Ballyshannon	Carrickgarve to Rossan Point, Co. Donegal.	Erne, Bundrowes, Bunduff, Eske, Eanev Water, Oily, Glen.
No. 14[1] Letterkenny	Rossan Point to Malin Head, Co. Donegal.	Owenea, Gweebarra, Gweedore (Crolly), Clady, Lackagh, Lennon, Crana.
No. 17[2] Dundalk	Carlingford Lough to Clogher Head, Co. Louth.	Fane, Dee, Glyde.
No. 17[1] Drogheda	Clogher Head to the most easterly point on Red Island, Skerries, Co. Dublin.	Boyne, Blackwater, Deel.

NOTE.—The area comprised in the former No. 14[2] or Moville District was, by the Foyle Fisheries Act, 1952, incorporated in the Foyle Area which is administered by the Foyle Fisheries Commission.

INLAND FISHERIES

The total catch of salmon by all methods in 1957 was 1,799,543 lb. compared with 1,443,340 lb. for the previous year. The value of this catch was £447,817 compared with £415,931 for the year 1956. The catch of sea trout amounted to 100,503 lb. valued at £15,615 compared with 93,152 lb. valued at £15,136 for 1956. The total quantities and value of salmon and sea trout taken in the years 1955, 1956 and 1957 are shown in Appendix 9. The catch of salmon and sea trout made in the former Moville Fishery District is not included in the above figures but is included in the report of the Foyle Fisheries Commission to which reference will be made later.

During 1957 conditions on the whole were fairly favourable to netting in the early part of the season but catches made during that period were not good due to the fact that the runs of spring fish were only of moderate size. The runs of grilse were again late but in the northern half of the country, particularly in the west and north-west, they were exceedingly large, being adjudged better than most years in the previous three decades. During the runs of grilse, while conditions for netting were not entirely favourable, large catches were made in some areas. In the middle of July heavy landings of grilse, particularly in the north-west, depressed the price of salmon on certain British markets to a point lower than had been realised for many years. This depression of the price of grilse accounts for the reduced average export price of salmon for 1957 (6s. 1d. per lb. f.o.b.) when compared with that of previous years.

Particulars of the catches of salmon made in each fishery district for the years 1955, 1956 and 1957 are given in Appendices 10 and 14. The catch of salmon in 1957 was distributed as to the various methods of capture as follows :—

Draft nets	55·8%
Rod and line	17·2%
Drift nets	16·5%
Stake nets and other commercial methods	10·5%

The proportion of fish taken on rod and line was slightly lower in 1957 than in the previous two years but was still maintained at a high level. The actual number of fish so taken in 1957 was in fact a record at 39,647 and the weight was also considerably up on that of 1956. The increase in the rod catch was partly due to the very large number of heavy grilse taken during the year. The average weight of salmon landed on rod and line was 7·8 lb. in 1957 compared with 7·4 lb. in 1956 and 8·6 lb. in 1955 when grilse runs were not so good.

The total number of rod licences (excluding endorsements) issued in 1957 was 7,785 representing an increase of 290 on that of 1956. The average catch of salmon per licence was 5·0 fish weighing 39·7 lb. and valued by their captors at £10 15s. 0d. The average number, weight and value of salmon taken on the rod showed a slight increase over that of 1956. The heaviest average weight of salmon taken on rod and line was again for the Drogheda district for which the figure was 11·4 lb. compared with 12·3 lb. for 1956. In this district the bulk of the fish taken on rod and line are early-running and, therefore, comparatively heavy fish. The lowest average weight (6·3 lb.) was for the Letterkenny district where the bulk of the rod-caught fish are grilse.

The catch of sea trout by all methods showed an increase over that of the previous year. This increase was mainly made up of an increase in the catch by commercial methods. Sea trout catch was distributed as follows:—

Rod and line	56·3%
Draft nets	37·1%
Other commercial methods ...	6·6%

The average catch of sea trout per rod was 7·2 fish weighing 7·2 lb. and valued at about 22s. These figures were just slightly less than the corresponding figures for 1956. More than 10 fish per licence were taken in the Dundalk (32), Connemara (29), Bangor (16), Cork (13), and Wexford (12) Fishery Districts.

The drift net fishery for salmon off the coast of Donegal and the northern coast of Co. Mayo had a very successful season which may be attributed to the excellent runs of grilse, upon which the fishery mainly depends, as well as to favourable fishing conditions from the end of June onwards.

The smolt migration in 1957 was reported generally to be satisfactory in most districts and the spawning season of 1957/1958 was also reported to be exceedingly good in most areas where, owing to the continuous high water, the fish were undisturbed. Very few cases of furunculosis came to notice. Heavy mortality occurred below the Inniscarra Dam on the River Lee, the cause being a depletion of oxygen in the water held up in the reservoir above the dam, due, presumably, to the decaying of vegetation submerged when the reservoir was first filled some time previously. Suitable action was taken by the Boards of Conservators concerned. Cases of pollution during the year were not numerous.

During 1957 the Dublin Wholesale Fish Market handled 53,040 salmon and grilse weighing 381,745 lb. compared with 39,172 fish weighing 292,503 lb. in 1956.

A number of visits was paid by officers of the Department to markets in Great Britain for the purpose of inspecting Irish salmon received there and dealing with problems of the handling,

transport, etc., of this fish. As a result of these visits and information obtained therefrom, the Inspector and Scientific Adviser and one of the Assistant Inspectors held a series of meetings with exporters of salmon at which problems of improved marketing were discussed in full.

The yield of the eel fisheries at 189,712 lb. valued at £23,501 was higher than in the previous year. Output in the Drogheda Fishery District rose from 8,696 lb. in 1956 to 13,458 lb. in 1957 and in the Limerick Fishery District from 94,627 lb. in 1956 to 106,957 lb. in 1957 and these increases more than offset the fall in production in the Waterford, Ballina, Sligo and Ballyshannon Districts. Appendix 12 gives details of the catches of eels both as to quantity and value for each fishery district in which eel fishing was carried on in the years 1955, 1956 and 1957. In eight of the seventeen fishery districts eel fishing was not pursued in 1957.

BOARDS OF CONSERVATORS.—The receipts and expenditure of Boards of Conservators during the fishery years ended 30th September, 1957, and 30th September, 1956, were:—

RECEIPTS:	1957 £	1956 £
Licence Duty	19,489	18,279
Fishery Rates	31,996	31,597
Subscriptions	1,231	782
Exchequer Grants and Grants from Salmon Conservancy Fund	13,082	13,709
Miscellaneous Receipts ...	2,416	1,957
	£68,214	£66,324

EXPENDITURE:		
Salaries, etc.	11,193	11,007
Travel, etc.	14,788	15,310
Waterkeepers	38,434	37,996
Law Costs	1,976	1,956
	£66,391	£66,269

The foregoing summary of receipts and expenditure does not include sums received by way of Special Local Licence Duty surrendered to the Exchequer in pursuance of Section 13 of the Fisheries (Tidal Waters) Act, 1934. Details of the financial receipts and expenditure of each Board are given in Appendix No. 16.

EMPLOYMENT IN THE INDUSTRY.—Exclusive of persons employed in the marketing and transport of fish a total of 5,236 persons found either whole-time or part-time employment in inland fisheries during the year. The figure includes some 3,224 persons engaged in netting for salmon under common law right and 813 employed by Boards of Conservators on protection of fisheries over the open and close seasons, the remainder being employed by proprietors of commercial salmon fisheries, by fishery owners or by angling associations.

INSTRUMENTS OF CAPTURE.—The total number of fishing licences of all kinds issued during the year was 10,531, representing an increase of 396 on the total for 1956. The totals in recent years were : 1956, 10,135 ; 1955, 9,027 ; 1954, 8,690 ; 1953, 8,444 ; 1952, 7,990 ; 1951, 7,563. The numbers of the various classes of licences issued in each fishery district during the year and the rates of licence duty are given in Appendices 17 and 18 respectively.

SALMON EXPORTS.—The quantity of salmon exported in 1957 was 15,710 cwt. valued at £534,040 as compared with 13,564 cwt. valued at £557,016 in 1956. These figures include salmon landed in County Donegal from waters in the area administered by the Foyle Fisheries Commission.

The 1957 figures show an increase of 2,146 cwt. in quantity and a decrease of £22,976 in value on the 1956 figures. The average export price per cwt. at £33 19s. 10d. obtained in 1957 was lower than in 1956 when the figure was £41 1s. 3d.

The number of salmon exporters licensed under the Agricultural and Fishery Products (Regulation of Export) Act, 1947 (Export of Salmon) Order, 1954 (S.I. No. 275 of 1954) was 83. Of the total quantity of salmon exported, 14,280 cwt. went to markets in Great Britain and 775 cwt. to France. The balance went to the Six Counties, Germany and Switzerland.

ARTIFICIAL PROPAGATION OF SALMON AND TROUT.—In the 1956/57 spawning season conditions were satisfactory for the capture of parent fish at most centres ; the output of salmon ova was somewhat less however than in the previous years. A total of 962,000 salmon ova and 150,000 sea trout ova was distributed from hatcheries controlled or subsidised by the Department. The hatcheries at Loughs Owel and Ennell operated by the Department in conjunction with the local anglers' association yielded 1,074,000 ova, of which 501,000 were distributed to angling associations and others, and the balance (573,000) were hatched out at Loughs Owel and Ennell, the resultant fry being placed in the neighbouring waters.

Brown trout ova numbering 500,000 and 100,000 rainbow trout ova were imported by the Inland Fisheries Trust Incorporated from Great Britain. The rainbow trout ova were

hatched out at the Fanure Fish Farm near Roscrea. A proportion of these fish were planted out as fingerlings in waters selected by the Trust for experimental stocking, the remainder being marketed for table use. Further reference is made to the Inland Fisheries Trust's Fish Farm in a separate section of this Report dealing with the general work of the Trust.

At its trout farm at Rosetown (Newbridge, Co. Kildare) the North Kildare Anglers' Association reared 30,000 trout to the fingerling stage as in the previous year.

Details of the fry produced at the various hatcheries and hatching stations, apart from these at the Fish Farm mentioned, are given in Appendix 21.

SCIENTIFIC INVESTIGATIONS.—During 1957 investigations were continued into the movement of salmon in the sea around Ireland. One hundred and ninety-nine fish taken in drift nets by boats fishing out of Downings, Co. Donegal were tagged and released. Twenty-two tagged fish were recaptured as follows :—Portballintrae, Co. Antrim (1), River Bann (1), River Foyle (4), Crana River (1), River Lackagh (2), Ballyness Bay (1), Clady River (2), Bunbeg, Co. Donegal (1), Trawenagh Bay (1), Gweebara River (1), River Owenea (3), Glen River (1) and River Moy (3). These results were somewhat similar to those of previous years except that the proportion of recaptures in County Donegal was higher, possibly because the majority of fish were tagged somewhat closer inshore than in previous years. At the end of operations in 1957 it was decided to cease tagging along the Donegal coast and a report on the operations from 1953 to 1957, inclusive, prepared by the Inspector and Scientific Adviser was accepted for publication in the *Proceedings of the Royal Irish Academy*. A preliminary report on this work in 1957 was also given at the Bergen meeting of the International Council for the Exploration of the Sea.

Tagging of kelts of salmon and sea trout was again carried on at a number of stations, namely Ballisodare, Co. Sligo, Banteer, Co. Cork ; Glenties, Co. Donegal and Lismore, Co. Waterford. In all 996 fish were tagged and released. Recaptures, totalling 20, were made during the year, partly from previous years' taggings. Five fish tagged as smolts at Ardnacrusha in 1955 were also reported as having been recaptured. Tagging of spent fish at Treanlaur, Co. Mayo, was continued by the Salmon Research Trust of Ireland Inc.

A report on the movements of salmon in the estuary of the River Shannon is printed as an Appendix (No. 27) to this Report.

Scales and relevant data from the Rivers Shannon, Erne, Moy and Corrib were received during the year. A report by one of the Assistant Inspectors of Fisheries on the Salmon of the River Shannon for the years 1952 to 1956 was completed and was published in the *Journal du Conseil* of the International Council for the Exploration of the Sea. A valuable series of

observations on the salmon of the River Shannon has, therefore, been collected from 1941 when Thomond Weir started operations for the first time for a full season.

Material from the River Erne was examined in conjunction with the records of the numbers of fish entering the river, with a view to forecasting the state of the fishery in the next few seasons. It was concluded from the available data that the stocks of fish in the river were in so critical a state as to cause grave concern for the survival of the species in this river to support even a moderate fishery. The question of a curtailment of fishing to enable the stocks to recover was under consideration at the close of the year.

Officers of the Department again collaborated with officers of the Ministry of Commerce, Belfast in a research programme on salmon and sea trout of the River Foyle. During 1957 salmon taken in drift nets in Lough Foyle and in the draft nets at Culmore were tagged and released alive. Collections of scales made in 1956 from fish taken in the Foyle Fisheries Commission's own nets were examined and a report thereon was included in the Sixth report of the Commission. A report on the sea trout of the River Foyle based on material collected over a period of years was also included in the same report.

In connection with activities of the Irish Specimen Fish Committee a number of sets of scales of notable Irish rod-caught fish were examined in the Department's laboratory. Members of the public continue to send in sets of scales for age determination, etc., and officers of the Department have been engaged from time to time preparing reports on such material.

Assistance was given during the year to various Boards of Conservators in connection with Court proceedings. In a number of cases the expert interpretation of evidence of fish scales was an important element and for this purpose the services of officers of the Department were made available as required.

One of the Assistant Inspectors of Fisheries who is a member of the Council of the Inland Fisheries Trust Inc. continued to investigate the material collected by the Trust in connection with its work in eradicating pike from certain trout waters. These investigations have added further evidence for the conclusion that the pike is one of the greatest obstacles to the full development of brown trout fisheries in many of the more important waters in this country, as well as of the salmon fisheries in waters where the pike exists.

A number of freshwater fishes sent to the Department for examination included some char and further specimens of the lacustrine form of twaite shad from the Killarney lakes.

Advice and assistance on various scientific matters were afforded to the Boards of Conservators, the Foyle Fisheries Commission, the Inland Fisheries Trust, the Salmon Research Trust of Ireland and associations and fishery owners generally throughout the year.

ENGINEERING.—The hydro-electric scheme on the River Lee was completed during the year and the reservoirs were filled bringing into operation the hydraulic fish lift passes at Inniscarra and Carrigadrohid. The turbines did not go into operation until relatively late in the year. Difficulties were experienced in the initial period of operation of the fish lifts resulting in injury to or death of salmon and smolts. Many of these difficulties have, however, been eliminated and those remaining are receiving attention.

On the River Clady those engineering works having a direct effect on fish life were completed but the reservoirs were not filled. Preliminary discussions took place with representatives of the Electricity Supply Board as to the works to be undertaken to mitigate the adverse effects on fish life of reduced flow in the river downstream of the dam at Gweedore.

Arterial drainage work was continued on the Corrib/Clare catchment in Co. Galway some of the spawning areas of which were adversely affected by the drainage operations. It was recommended that a fish trap, hatchery and rearing establishment be set up at Cong, Co. Mayo, by means of which the various affected waters could be restocked with salmon summerlings. A survey of the selected site was made and plans for the necessary installations prepared. In addition to offsetting the curtailment of potential spawning areas this scheme will also serve to eliminate the wastage of salmon caused each year by the drying out of the Cong canal. The development of the scheme for a sluice barrage across the River Corrib at Galway to replace the existing structure was kept under constant review. Advice was given and, where necessary, designs were prepared covering works considered necessary for the preservation of certain features of the fisheries in Galway likely to be affected by excavation in the river bed or by work on the sluice barrage.

At the request of the Foyle Fisheries Commission proposals involving abstraction of water from the River Faughan were examined and reported upon and recommendations made.

Certain ameliorative works in the interests of fisheries were carried out on the Rye River at and above Leixlip on which drainage work had been done.

Other activities in connection with drainage schemes included :

(*a*) advice on modification of the Drumcar fish pass (Glyde and Dee) ;

(*b*) advice regarding facilities for passage of fish on the River Feale ;

(*c*) discussions with drainage engineers regarding works proposed for Rivers Moy, Inny, Maine and Deele-Swillyburn.

The following matters were also dealt with :—

(*d*) Ballyar, Co. Donegal—construction of fish pass to design of Fisheries Division was supervised ;

(*e*) Claddagh Basin, Galway—local authority advised on work required for protection of salmon ;

(*f*) Owengowla River—owner advised on improvements necessary to enhance the value of salmon and trout fishing ;

(*g*) Burrishoole River—survey made at request of Salmon Research Trust to devise improvement for fish rearing facilities ;

(*h*) general pollution problems including one of a discharge from a tannery the management of which took remedial measures in accordance with the advice given.

Investigation of the problem caused by the discharge of silt-laden water from bogs being developed by Bord na Móna, into salmon and trout streams was continued.

At the request of the Salmon Research Committee set up by the Scottish Home Department, the Inspector and Engineer gave evidence in Edinburgh as to the passage of salmon and smolts past dams. A report prepared by the Assistant Fisheries Engineer on a study tour of inland fisheries in Sweden was published and circulated widely. Our officer attended the meetings of the Salmon and Trout Association in London which discussed matters relating to water abstraction. He continued to act as a member of the Council of the Inland Fisheries Trust Incorporated and to advise the Trust on the engineering aspects of various improvement schemes being undertaken by it.

Advice and assistance on various engineering matters affecting fisheries were afforded to Boards of Conservators, the Foyle Fisheries Commission, the Salmon Research Trust and Angling Associations.

OFFENCES AGAINST THE FISHERY LAWS.—The number of prosecutions instituted during 1957 was 230 as compared with 266 in 1956. The Gárda Síochána continued to co-operate with Boards of Conservators in the protection of inland fisheries throughout the year.

FOYLE FISHERIES COMMISSION.—The Commission, which consists of two members nominated by the Minister for Lands, Dublin, and two by the Ministry of Commerce, Belfast, was established under the Foyle Fisheries Act, 1952, and entrusted with the management of the several fisheries in the tidal waters of the River Foyle and the conservation and protection of fisheries in the Foyle Area.

The total catch of salmon and sea trout in the Area in 1957, as published in the sixth Annual Report of the Commission,

which covers the period of twelve months ended on 30th September, 1957, was as follows :—

	Salmon		Sea Trout		Total	
	Number	lb.	Number	lb.	Number	lb.
Nets ...	99,440	682,257	2,470	4,031	101,910	686,288
Rods ...	3,392	22,996	3,127	3,480	6,519	26,476
Total ...	102,832	705,253	5,597	7,511	108,429	712,764

The total yield in the 1957 season was a record one. The Foyle system shared in the heavy run of grilse already noted for neighbouring rivers ; and as in the 1956 season, heavy flood conditions which occurred in the months of July and August again favoured the upstream netsmen and anglers.

INLAND FISHERIES TRUST INCORPORATED.—During 1957 the Inland Fisheries Trust Incorporated continued its work of promotion and development of brown trout fisheries. For this purpose a Grant-in-Aid, which amounted to £12,500 in the financial year 1957/58, is provided annually from the Fisheries Vote. Details of the Trust's activities and financial statements are given in the Secretary's Report presented to the Eighth Annual General Meeting of the Trust held on 18th April, 1958. The year under review saw a large scale expansion of the Trust's activities made possible by amendment of its Memorandum of Association which enabled it to participate in the scheme for the development and exploitation of all forms of angling being sponsored by Bord Fáilte Éireann. Trout development work was intensified on a number of lakes and rivers while a considerable number of waters were surveyed for future development. Coarse fish waters were improved in the tourist interest. Constructional work on the central fish farm at Fanure was nearing completion and as it was in partial production during the year it was possible to increase substantially the trout fingerling programme. During 1957 Kilbrean Lake (Killarney) and rights over much of the Black River (Co. Galway) were acquired by the Trust. The Trust carried out a series of experimental stockings with rainbow trout (Autumn spawning *shasta*) to ascertain whether the rainbow trout is a worthwhile proposition as a sporting fish in Irish waters and, if so, what conditions suit it. These experiments are being continued. In September, further experiments in the use of electricity as a means of removing dace and roach from game fish waters were carried out in the Munster Blackwater. The Trust undertook a scheme of predator reduction in the Boyne system on behalf of Bord na Móna with a view to increasing the survival of smolts and parr and thus securing a greater yield from the spawning taking place in the river and its tributaries.

SALMON RESEARCH TRUST OF IRELAND, INCORPORATED.—Details of the activities of the Trust and financial statements are given in the report of the Committee of Management of the Trust for the year ended 31st December, 1957. The biological survey of the Burrishoole River system was continued during the year and collections of scales of salmon, sea trout and brown trout were made with a view to ascertaining details of the life history of the salmonid fishes of this river system. The Trust continued the rearing experiments started in 1956 for separate study of fry derived respectively from parents identified as spring fish and parents identified as grilse. A number of young salmon which had reached smolt size were tagged and released. Some interesting information on the predations of salmonid fishes was also obtained. Kelts of salmon and sea trout from the hatchery at Treanlaur as well as those taken in draft nets operating in Lough Furnace were tagged and released.

During 1957 the Trust erected a research laboratory at Treanlaur, Newport, Co. Mayo, which on being formally opened on the 15th August, 1957, was named "The Farran Laboratory" after the late George Philip Farran (Chief Inspector of Fisheries from 1938 to 1946) an outstanding scientist in the domain of fishery research.

The Trust is financed by contributions from Arthur Guinness Son & Co., Ltd., and from the Fisheries Vote.

LEGISLATION.—The levy on salmon exports under the Salmon Conservancy Fund Act, 1954 (No. 4 of 1954) which had been discontinued as from 1st January, 1955, was reimposed as from 14th June, 1957, by Order entitled Salmon Export Levy Order, 1957 (S.I. No. 115 of 1957). The rate of levy and manner of payment were prescribed by the Salmon Export Levy Regulations, 1957 (S.I. No. 116 of 1957). Levy to the amount of £4,874 was paid up to 31st December, 1957.

The Fisheries (Amendment) Bill, 1957, was introduced in Dáil Éireann on 4th December, 1957. The Long Title of the Bill as introduced was "An Act to amend and extend the Fisheries Acts, 1842 to 1956, in respect of certain matters, including the right to vote at elections of conservators for electoral divisions, fishing licences (including licences to take oysters from certain public oyster fisheries) and the licence duty payable thereon, to re-enact, with modifications, the Salmon Conservancy Fund Act, 1954, and to provide for other related matters".

No further stages of the Bill had been taken before the close of the year.

During the year three Statutory Instruments and one Bye-law were made, particulars of which are given in Appendix No. 20.

ERSKINE H. CHILDERS
Minister for Lands.

May 30, 1959.

APPENDICES TO THE REPORT ON SEA AND INLAND FISHERIES FOR THE YEAR 1957.

Appendix

APPENDIX No. 1.

Total Quantity and Value of SEA FISH (excluding Salmon) returned as LANDED during the year 1957.

KINDS OF FISH	EAST COAST (Omeath to Carnsore Point)		SOUTH COAST (Carnsore Point to Loop Head)		WEST COAST (Loop Head to Erris Head)		NORTH COAST (Erris Head to Moville)		TOTAL	
	Cwts.	£	Cwts.	£	Cwts.	£	Cwts.	£	Cwts.	£
Brill ...	182	2,114	754	6,779	113	1,200	195	2,030	1,244	12,123
Cod ...	14,626	61,673	4,319	17,373	826	4,932	6,825	29,750	26,596	113,728
Conger Eel	289	603	100	194	6	7	93	243	488	1,047
Haddock	4,960	12,340	18,781	39,533	447	1,752	1,847	28,300	39,005	81,925
Hake	737	4,935	546	1,690	190	1,012	1,231	5,475	2,704	13,112
Ling ...	267	656	87	165	2	4	152	390	508	1,215
Plaice	9,616	66,866	7,380	54,522	1,208	8,228	4,468	39,047	22,672	168,663
Ray or Skate ...	11,848	28,919	7,162	18,941	7,007	9,907	4,680	13,677	30,697	71,444
Soles ...	441	7,264	1,342	19,486	87	1,415	232	4,054	2,102	32,219
Turbot	175	1,861	993	7,967	144	1,866	197	2,036	1,509	13,730
Whiting	49,196	43,050	26,378	42,200	11,369	13,986	14,556	19,055	101,499	118,291
Other kinds	7,068	18,961	11,236	23,859	4,389	8,096	8,005	14,917	30,698	65,833
TOTAL DEMERSAL	99,405	249,242	79,078	232,709	25,788	52,405	55,451	158,974	259,722	693,330
Herrings	6,506	7,000	122,317	95,443	3,156	4,221	101,386	66,363	233,365	173,027
Mackerel	57	144	18,726	28,416	1,354	3,308	2,776	4,341	22,913	36,209
Sprats	—	—	—	—	—	—	16,475	4,553	16,475	4,553
TOTAL PELAGIC	6,563	7,144	141,043	123,859	4,510	7,529	120,637	75,257	272,753	213,789
TOTAL WET FISH	105,968	256,386	220,121	356,568	30,298	59,934	176,088	234,231	532,475	907,119
	No.		No.		No.		No.		No.	
Crabs	21,008	372	30,842	731	1,484	31	18,996	401	72,330	1,535
Crayfish	—	—	104,646	33,979	49,436	17,888	3,857	1,165	157,939	53,032
Escallops	—	—	215,930	2,912	218,580	2,732	—	—	434,510	5,644
Lobsters	46,098	8,438	167,138	34,132	96,280	19,698	175,828	35,393	485,344	97,661
Oysters	—	—	56,574	561	481,186	4,828	—	—	537,760	5,389
	Cwt.		Cwt.		Cwt.		Cwt.		Cwt.	
Norway Lobsters	6,505	23,702	—	—	—	—	300	900	6,805	24,602
Mussels	10,496	3,137	34,606	7,741	..	—	—	—	45,102	10,878
Periwinkles	3,828	3,828	13,652	14,471	16,235	16,340	5,965	6,102	39,680	40,741
Other Shellfish	6	6	230	480	—	—	—	—	236	486
TOTAL VALUE SHELLFISH	—	39,483	—	95,007	—	61,517	—	43,961	—	239,968
TOTAL VALUE ALL FISH	—	295,869	—	451,575	—	121,451	—	278,192	—	1,147,087

APPENDIX No. 2.

Comparison for the eight years, 1950–57, of the Average Prices per cwt. of various kinds of Sea Fish.

	1950	1951	1952	1953	1954	1955	1956	1957
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brill	8 6 5	7 14 5	8 14 11	9 7 10	8 9 10	8 15 3	9 11 4	9 14 11
Cod	4 14 2	4 15 3	4 5 7	4 11 4	5 1 4	4 14 0	4 12 6	4 5 6
Conger Eel ...	1 16 7	1 18 0	1 16 2	1 3 2	1 11 0	1 15 5	2 1 2	2 2 11
Haddock ...	4 7 0	4 15 4	3 12 8	2 2 2	2 8 5	2 0 2	2 5 5	2 2 0
Hake	4 7 4	3 8 11	2 18 7	2 18 0	3 18 3	4 17 6	5 17 11	4 17 0
Ling	2 3 9	2 5 2	3 6 0	3 16 4	3 10 7	2 10 5	2 10 11	2 7 10
Plaice ...	5 15 0	5 19 2	5 10 11	5 8 9	7 11 2	7 3 7	7 2 3	7 8 9
Ray or Skate ...	2 2 8	2 3 9	2 5 10	2 12 5	2 12 11	2 8 8	2 9 3	2 6 7
Soles	9 18 9	10 5 9	10 8 9	9 12 6	11 5 5	11 5 0	12 11 4	15 6 7
Turbot ...	7 10 0	7 12 4	7 19 8	9 7 1	8 9 0	7 18 9	9 15 3	9 2 0
Whiting ...	1 12 10	1 13 9	1 12 10	1 14 0	1 12 8	1 12 0	1 9 2	1 3 4
Herrings ...	0 16 4	1 2 10	1 2 0	1 3 9	1 1 4	0 15 3	0 14 9	0 14 10
Mackerel ...	1 0 7	1 3 5	1 12 3	1 9 11	1 9 9	1 12 9	1 15 10	1 11 7
Sprats ...	0 5 1	0 6 3	0 8 3	0 8 0	0 3 6	0 4 2	0 10 0	0 5 6

N.B.—"Average price" as shown in this table represents total value divided by total weight for each kind of fish, year by year. It does not purport to take direct cognizance of any abnormal rise or fall in price attributable to a seasonal glut or shortage of a particular kind of fish.

APPENDIX No. 3.

FISH IMPORTS AND EXPORTS, 1957.

(as compared with those of 1956).

	Quantity		Value	
	1957	1956	1957	1956
	cwt.	cwt.	£	£
I.—IMPORTS				
Fish (except shellfish) not canned :				
Fresh, chilled or frozen	4,156	5,785	19,730	17,265
Dried, salted, smoked or cooked	23,643	27,750	131,894	151,036
Shellfish, not canned ...	3,182	3,376	17,926	14,109
Fish (including shellfish) and fish preparations canned	15,678	28,930	249,544	517,014
TOTALS ...	46,659	65,841	419,094	699,424
II.—EXPORTS				
Fish (except shellfish) fresh, chilled or frozen				
Salmon	15,710	13,564	534,040	557,016
Herrings	118,636	46,086	157,736	64,356
Fresh water eels ...	2,483	2,202	30,718	29,515
Other fish ...	35,299	16,822	57,301	26,322
Fish dried, salted or smoked, not canned	21,274	20,080	72,977	38,896
Shellfish fresh, chilled, frozen, salted, dried	82,261	84,962	329,358	311,525
Fish (including shellfish) and fish preparations canned	227	1	4,898	27
TOTALS ...	275,890	183,807	1,187,228	1,027,887

The figures given above for exports of salmon and trout include those relating to exports from the former Moville Fishery District now comprised in the Foyle Area.

APPENDIX No. 4.

HERRING FISHING, 1957.

County	Ports at which more than 500 cwt. were landed.	Total Quantity cwt.	Value £
Louth	Clogher Head ...	1,311	1,901
Dublin	Howth ...	1,185	1,032
Wicklow	Arklow	1,930	2,506
Wexford	Courtown, Rosslare Strand, Kilmore Quay	3,075	2,556
Waterford	Dunmore East ...	119,165	91,023
Cork	Georahies	1,625	2,480
Kerry		532	945
Clare		161	305
Galway		655	979
Mayo	Achill, Keel and Keem	2,350	2,937
Sligo		1	2
Donegal	Killybegs, Burton Port, Kincasslagh, Bunbeg	101,386	66,361
	TOTALS ...	233,365	173,027

APPENDIX No. 5.

MACKEREL FISHING, 1957.

County	Ports at which more than 250 cwt. were landed.	Total Quantity cwt.	Value £
Louth		—	—
Dublin		37	144
Wexford	Kilmore Quay, Duncannon	570	855
Waterford	Dunmore East, Tramore, Bunmahon, Passage East, Ballinagoul	4,132	5,699
Cork	Baltimore, Schull, Castletownbere	9,137	16,273
Kerry	Cahirciveen, Dingle	4,887	6,589
Clare		319	1,119
Galway		579	1,295
Mayo	Lacken	2,045	3,576
Sligo		72	100
Donegal	Malinbeg	1,115	1,559
	TOTALS ...	22,913	36,209

APPENDIX No. 6.

PERSONNEL ENGAGED IN FISHING; AND REGIONAL DISTRIBUTION AND CLASSIFICATION OF FISHING CRAFT IN 1957.

HOW ENGAGED (i.e., whether solely or partially)	MEN	Steam Vessels		Motor Vessels						Sail Boats						Row Boats		Total Vessels
				1st Class			2nd Class		3rd Class	1st Class			2nd Class		3rd Class			
		200 tons gross and over	100 tons gross and over but less than 200 tons.	25 tons gross and over.	20 tons gross and over but less than 25 tons.	15 tons gross and over but less than 20 tons.	10 tons gross and over but less than 15 tons and of 18 feet keel and upwards.	Under 10 tons and of 18 feet keel and upwards.	Less than 18 feet keel.	25 tons net and over.	20 tons net and over but less than 25 tons.	15 tons net and over but less than 20 tons.	10 tons net and over but less than 15 tons and of 18 feet keel and upwards.	Under 10 tons and of 18 feet keel and upwards.	Less than 18 feet keel.	Unclassed A — Open boats of 18 feet keel and upwards and canoes of 18 feet or more over all.	Unclassed B — Open boats of less than 18 feet keel and canoes of less than 18 feet over all.	
EAST COAST:																		
Solely engaged	448	—	—	30	2	4	[illegible]	16	—	—	—	—	—	[illegible]	—	32	3	122
Partially engaged	367	—	—	1	1	4	[illegible]	20	—	—	—	—	—	11	[illegible]	51	5	97
Laid-up	—	—	—	[illegible]	—	—	[illegible]	1	1	—	—	—	—	[illegible]	3	16	—	32
TOTALS	815	—	—	33	10	8	12	37	1	—	—	—	—	18	5	99	8	351
SOUTH COAST:																		
Solely engaged	619	—	—	48	[illegible]	7	31	113	[illegible]	—	—	—	[illegible]	45	26	155	32	467
Partially engaged	1,216	—	—	—	—	—	[illegible]	50	3	—	—	—	3	34	[illegible]	109	48	279
Laid-up	—	—	—	1	—	—	—	7	—	—	—	—	1	[illegible]	12	14	6	46
TOTALS	1,835	—	—	49	3	7	38	170	5	—	—	—	9	84	63	278	86	792
WEST COAST:																		
Solely engaged	229	—	—	11	3	4	4	24	—	—	—	—	—	33	[illegible]	168	139	393
Partially engaged	1,494	—	—	—	3	1	1	3	—	—	—	—	—	31	15	86	117	264
Laid-up	—	—	—	—	1	[illegible]	—	6	—	—	—	—	—	19	[illegible]	40	51	124
TOTALS	1,723	—	—	11	7	7	5	33	—	—	—	—	[illegible]	83	27	294	307	781
NORTH COAST:																		
Solely engaged	317	—	—	24	1	[illegible]	9	33	—	—	—	—	—	110	6	119	29	398
Partially engaged	1,322	—	—	1	—	4	3	25	1	—	—	—	—	61	8	48	39	191
Laid-up	—	—	—	1	—	—	—	[illegible]	—	—	—	—	—	13	3	10	20	[illegible]
TOTALS	1,739	—	—	26	1	11	12	124	1	—	—	—	—	184	17	177	88	641
TOTALS FOR 1957:																		
Solely engaged	1,613	—	—	133	16	22	50	246	[illegible]	—	—	—	[illegible]	190	39	474	203	1,380
Partially engaged	4,399	—	—	[illegible]	4	9	13	104	4	—	—	—	5	137	50	204	209	831
Laid-up	—	—	—	4	1	[illegible]	4	19	1	—	—	—	1	42	23	80	77	254
TOTALS	6,112	—	—	139	21	33	67	369	7	—	—	—	11	369	112	848	489	2,465

APPENDIX No. 7.

TRAWLING AND SEINING, 1957.

Port or Locality	Number of men engaged	Number of boats engaged	Tonnage of Motor Boats			Fishing Period
			Not exceeding 10 tons	Over 10 tons	Over 15 tons	
Clogher Head	40	8	—	—	8	All year.
Balbriggan	25	5	—	—	5	All year.
Skerries	35	8	—	—	8	All year.
Howth	75	9	—	—	9	All year.
Dublin	19	4	2	—	2	All year.
Dún Laoghaire	20	5	—	—	5	All year.
Wicklow	5	1	—	—	1	All year.
Arklow	80	18	—	2	16	All year.
Courtown	3	1	—	1	—	May to September.
Wexford	40	7	—	—	7	All year.
Rosslare Harbour	12	2	—	—	2	All year.
Kilmore Quay	60	12	—	9	3	All year.
Bannow and Bar of Lough	8	2	2	—	—	May to October.
Duncannon	15	3	2	2	1	All year.
Passage East	25	10	8	—	2	All year.
Dunmore East	20	5	—	—	5	March to November.
Tramore	8	2	2	—	—	April to September.
Bunmahon	3	1	1	—	—	May to September.
Dunabratton	6	2	2	—	—	May to September.
Helvick	24	6	4	—	2	All year.
Ballycotton	20	5	3	2	—	All year.
Youghal	5	1	—	—	1	All year.
Ratheoursey	3	1	1	—	—	May to September.
Cobh	20	5	4	1	—	All year.
Kinsale	4	1	—	1	—	All year.
Dooneen	4	1	—	1	—	April to October.
Union Hall	20	3	—	1	2	All year.
Castletownshend	15	3	—	2	3	All year.
Baltimore	20	4	—	—	4	All year.
Schull	13	2	—	—	2	All year.
Bantry	12	2	1	1	1	All year.
Castletownbere	50	8	1	—	7	All year.
Kilmakillogue	10	2	—	2	—	All year.
Sneem	4	1	1	—	—	April to September.
Ballinskelligs	6	1	—	—	1	All year.
Portmagee	24	4	—	—	4	All year.
Cahirciveen	30	5	—	1	4	All year.
Dingle	60	13	—	4	9	All year.
Fenit	4	1	1	—	—	April to October.
Liscannor	4	1	—	1	—	May to October.
Aran Islands	28	5	—	—	5	All year.
Galway	15	3	—	—	3	All year.
Carraroe	8	1	—	—	1	All year into Galway.
Carna	4	1	1	—	—	October to December.
Cleggan	12	3	—	—	3	April to October.
Mutrisk	4	1	—	—	1	Sporadically all year.
Achill	32	8	2	1	5	All year.
Lacken	3	1	1	—	—	May to October.
Kilcummin	6	2	2	—	—	May to October.
Kinlerrone	12	1	1	—	—	April to November.
Inishboran	8	2	2	—	—	May to September.
Killybegs	119	23	—	—	23	All year.
Teelin	10	6	—	—	6	All year.
Bartonport	6	8	2	—	6	January to September.
Kincasslagh	4	4	3	1	—	January to August.
Bunbeg	8	3	2	1	—	April to August.
Dunfanaghy	6	2	2	—	—	May to December.
Downings	15	4	3	—	1	All year.
Buncrana	10	3	1	—	2	March to November.
Culdaff	30	8	6	2	—	April to October.
Greencastle	54	14	7	6	1	All year.
Moville	22	6	4	—	2	All year.
Totals	1,274	291	75	41	175	

APPENDIX No. 8.

STATEMENT OF ACCOUNT

in respect of

Repayable Advances for the provision of boats and gear to fishermen made during the period of twenty-six years to 31st March, 1957, to the Irish Sea Fisheries Association, Ltd., to the date of the Association's dissolution, 23rd April, 1952, and to An Bord Iascaigh Mhara, as from that date.

	£			£
Repayable with Interest on an annuity basis in respect of:—		Repayments to 31st March, 1956		240,474
(a) Advances amounting to £729,642, made up to 31st March, 1956	1,108,874	Repayments made during year ended 31st March, 1957		35,970
(b) Advances amounting to £100,000, made during year ended 31st March, 1957	168,958	Balance outstanding:—		
		Due in arrear	£102,869	
		Instalments and Interest not matured ...	£892,519	995,388
	£1,277,832			£1,277,832

NOTE.—Advances made to the Association and the Board are repayable on the basis of a twenty year annuity in half-yearly instalments.

APPENDIX No. 9.

Quantity and Value of all Salmon and Sea Trout taken in each of the Three Years 1955, 1956 and 1957 by Instruments of Capture.

SALMON.

	1957	1956	1955	1957	1956	1955
	lb.	lb.	lb.	£	£	£
(A) ...	1,799,543	1,443,340	1,261,402	447,817	415,031	363,788
(B) ...	309,480	264,232	246,537	84,360	76,940	69,082
(C) ...	298,372	250,723	234,648	70,804	66,954	63,043
(D) ...	1,003,428	720,851	606,437	240,912	207,120	175,569
(E) ...	188,263	207,534	173,780	51,741	64,017	56,094

SEA TROUT.

	1957	1956	1955	1957	1956	1955
	lb.	lb.	lb.	£	£	£
(A) ...	100,303	93,152	73,201	13,615	13,136	10,824
(B) ...	56,375	56,192	42,285	8,517	8,519	5,931
(C) ...	3,564	1,231	1,432	515	177	246
(D) ...	37,357	33,599	27,509	6,031	5,964	4,273
(E) ...	3,007	2,130	1,975	549	176	374

(A)—Total for *all* engines.
(B)—Total for rod and line.
(C)—Total for drift nets.
(D)—Total for draft nets.
(E)—Total for stake nets, weirs, etc.

NOTE 1.—Appendices 9 to 15 are compiled from returns furnished by licence-holders in pursuance of the Statistics (Salmon Sea Trout and Eels) (No. 2) Order, 1945.

NOTE 2.—Appendices 9 to 15 do not include returns from the former Moville Fishery District.

APPENDIX No. 10.

Quantity and Value of Salmon taken in each of the Three Years 1955, 1956 and 1957 by Fishery Districts.

Fishery District	*	Quantity			Value		
		1957 lb.	1956 lb.	1955 lb.	1957 £	1956 £	1955 £
Dublin ...	R	4,137	5,761	4,703	1,297	1,994	1,591
	N	3,494	3,036	4,329	938	905	1,260
Wexford ...	R	17,699	18,467	24,059	5,088	5,543	7,079
	N	32,281	25,001	40,768	10,054	9,127	13,096
Waterford ...	R	32,018	31,242	33,854	8,955	9,506	9,745
	N	161,041	160,454	111,742	40,410	46,607	33,133
Lismore ...	R	38,129	30,878	37,596	10,374	9,018	10,104
	N	129,947	123,487	142,713	32,456	35,227	41,833
Cork	R	28,812	26,169	28,583	8,606	8,466	8,644
	N	85,681	76,150	78,487	24,816	26,614	27,656
Kerry ...	R	37,414	25,518	21,069	8,047	7,330	5,571
	N	232,305	115,118	94,240	48,730	31,267	26,466
Limerick ...	R	52,720	45,415	34,117	15,776	13,415	9,342
	N	135,835	146,530	116,898	38,709	45,996	35,850
Galway ...	R	4,160	7,734	4,438	1,248	2,225	1,285
	N	36,406	36,507	9,685	10,949	11,615	2,876
Connemara ...	R	7,740	5,409	5,526	2,322	1,623	1,658
	N	Nil	Nil	Nil	Nil	Nil	Nil
Ballinakill ...	R	3,502	6,277	4,461	1,116	1,474	1,263
	N	20,578	10,739	11,567	3,717	2,412	2,340
Bangor ...	R	9,897	4,628	4,543	2,429	1,354	1,257
	N	93,816	39,512	65,508	18,819	11,678	15,339
Ballina ...	R	27,447	23,443	14,567	6,279	5,870	3,379
	N	238,344	217,671	132,719	63,263	53,569	36,975
Sligo	R	4,638	3,643	3,303	1,391	1,037	859
	N	46,878	39,249	18,015	9,843	11,026	5,048
Ballyshannon ...	R	7,127	3,080	2,494	2,138	949	753
	N	68,778	53,094	55,013	12,309	13,932	14,295
Letterkenny ...	R	22,502	20,568	14,293	5,423	5,046	3,375
	N	133,500	76,318	76,431	25,551	18,352	19,362
Dundalk ...	R	1,360	1,279	538	217	338	130
	N	21,249	16,930	16,762	5,435	5,352	4,678
Drogheda ...	R	10,178	4,691	8,593	3,054	1,752	2,078
	N	49,840	39,312	40,958	17,458	15,222	13,959
TOTALS ...		1,799,543	1,443,340	1,261,402	447,817	415,931	363,788

*R indicates capture by means of single rod and line ; N by means of nets, weirs, etc.

APPENDIX No. 11.

Quantity and Value of Sea Trout taken in each of the Three Years 1955, 1956 and 1957 by Fishery Districts.

Fishery District	*	Quantity			Value		
		1957 lb.	1956 lb.	1955 lb.	1957 £	1956 £	1955 £
Dublin ...	R	1,447	1,553	841	258	256	133
	N	8,108	6,703	7,677	1,630	1,414	1,245
Wexford ...	R	3,837	2,624	2,771	460	408	388
	N	8,608	6,512	3,985	1,307	950	534
Waterford ...	R	1,966	1,204	870	318	171	110
	N	710	443	294	110	87	49
Lismore ...	R	1,740	436	550	337	60	79
	N	2,761	910	1,106	426	113	146
Cork	R	6,134	6,644	8,454	1,019	947	1,146
	N	1,419	1,583	2,450	165	229	354
Kerry ...	R	12,294	12,310	8,000	1,967	2,140	1,171
	N	4,450	2,425	3,070	752	516	521
Limerick ...	R	1,732	1,965	986	228	303	160
	N	7,431	10,107	4,275	1,305	1,999	827
Galway ...	R	1,440	1,747	809	216	279	147
	N	603	1,453	97	90	221	13
Connemara ...	R	9,949	10,880	8,842	1,542	1,360	1,106
	N	Nil	Nil	Nil	Nil	Nil	Nil
Ballinakill ...	R	636	1,734	2,670	80	734	370
	N	1,255	187	502	138	22	58
Bangor ...	R	5,766	4,801	1,997	837	717	296
	N	3,325	724	1,395	428	103	178
Ballina ...	R	1,186	549	167	208	73	25
	N	150	321	197	15	34	25
Sligo	R	618	371	131	93	63	19
	N	100	127	85	15	18	10
Ballyshannon ...	R	391	553	295	18	80	45
	N	469	156	2,424	50	18	389
Letterkenny ...	R	5,029	3,845	3,392	475	576	492
	N	573	954	478	79	151	61
Dundalk ...	R	628	362	201	85	58	29
	N	881	1,564	1,396	140	275	210
Drogheda ...	R	1,782	1,611	1,309	346	294	217
	N	3,085	2,797	1,476	388	467	273
TOTALS ...		100,503	93,152	73,201	15,615	15,136	10,821

*R indicates capture by single rod and line ; N by means of nets, weirs, etc.

APPENDIX No. 12.

Quantity and Value of Eels taken in each of the Three Years 1955, 1956 and 1957 by Fishery Districts.

Fishery District	Quantity			Value		
	1957 lb.	1956 lb.	1955 lb.	1957 £	1956 £	1955 £
Waterford ...	1,334	2,631	8,543	136	236	706
Limerick	106,937	94,627	89,678	13,358	11,683	9,308
Galway	53,008	50,253	52,865	6,805	6,625	5,800
Bangor	32	Nil	Nil	3	Nil	Nil
Ballina	6,249	9,066	13,509	664	885	1,325
Sligo	517	3,704	4,263	51	463	360
Ballyshannon ...	1,257	4,040	5,744	129	402	564
Dundalk	6,701	5,006	4,348	582	546	347
Drogheda ...	13,468	8,606	8,227	1,756	996	773
TOTALS ...	189,713	180,823	187,177	23,501	21,836	19,433

APPENDIX No. 13.

Total Quantity and Value of Salmon, Sea Trout and Eels taken by all engines in each of the Three Years 1955, 1956 and 1957 by Fishery Districts.

Fishery District	Total Weight for District			Total Value for District		
	1957 lb.	1956 lb.	1955 lb.	1957 £	1956 £	1955 £
Dublin ...	17,186	17,053	17,550	4,123	4,059	4,229
Wexford ...	62,425	52,064	71,583	16,909	16,023	21,097
Waterford ...	197,269	195,974	155,303	49,949	50,807	43,743
Lismore ...	172,577	155,711	181,965	43,595	44,418	52,232
Cork	122,046	110,546	117,783	34,606	36,256	37,300
Kerry	286,463	155,371	126,379	60,096	41,253	33,729
Limerick ...	304,675	298,674	244,964	69,436	73,306	55,747
Galway ...	95,707	97,604	67,894	10,308	20,965	10,121
Connemara ...	17,089	16,289	14,368	3,864	2,983	2,764
Ballinakill ...	25,971	21,937	19,260	5,031	4,642	4,031
Bangor ...	112,836	49,665	73,443	22,516	13,852	17,070
Ballina ...	273,376	251,050	161,159	70,426	60,431	41,729
Sligo	52,751	49,094	25,827	11,393	12,607	6,886
Ballyshannon ...	78,022	60,917	65,970	14,674	15,381	15,984
Letterkenny ...	161,604	101,685	94,594	31,528	24,125	23,290
Dundalk ...	30,819	26,041	23,245	6,450	6,569	5,403
Drogheda ...	78,343	57,110	60,583	23,002	18,731	18,209
TOTALS ...	2,089,759	1,717,415	1,521,780	486,933	452,903	394,615

APPENDIX No. 14.

Number, Quantity and Value of Salmon taken by Single Rod and Line during each of the Three Years 1955, 1956 and 1957 by Fishery Districts.

Fishery District	No. of Fish			Quantity			Value		
	1957	1956	1955	1957	1956	1955	1957	1956	1955
				lb.	lb.	lb.	£	£	£
Dublin ...	438	746	504	4,137	5,761	4,703	1,297	1,994	1,591
Wexford ...	1,630	1,834	2,268	17,699	18,467	24,059	5,088	5,543	7,079
Waterford ...	3,411	4,442	3,496	32,018	31,242	33,854	8,955	9,506	9,745
Lismore ...	4,704	3,562	4,073	38,129	30,878	37,596	10,374	9,018	10,164
Cork ...	3,591	3,185	3,000	28,812	26,169	28,383	8,606	8,466	8,644
Kerry ...	5,206	3,591	2,777	37,414	25,518	21,069	8,647	7,330	5,571
Limerick ...	6,983	6,718	4,312	52,720	45,445	34,117	15,776	13,415	9,342
Galway ...	595	1,176	712	4,180	7,734	4,438	1,248	2,225	1,285
Connemara ...	860	608	614	7,740	5,409	5,526	2,322	1,623	1,658
Ballinakill ...	427	952	662	3,602	6,277	4,461	1,116	1,474	1,263
Bangor ...	1,357	710	532	9,897	4,628	4,543	2,429	1,354	1,257
Ballina ...	4,288	3,698	2,227	27,447	23,443	14,567	6,279	5,870	3,379
Sligo ...	640	488	415	4,038	3,643	3,303	1,391	1,037	859
Ballyshannon	930	399	309	7,127	3,080	2,494	2,138	949	753
Letterkenny ...	3,558	2,134	2,058	22,502	20,568	14,293	5,423	5,046	3,376
Dundalk ...	136	141	50	1,360	1,279	538	217	338	139
Drogheda ...	887	380	552	10,178	4,691	8,593	3,054	1,752	2,978
TOTALS ...	39,647	35,757	28,561	309,180	264,232	246,537	84,360	76,940	69,082

APPENDIX No. 15.

Number, Quantity and Value of Sea Trout taken by Single Rod and Line during each of the Three Years 1955, 1956 and 1957 by Fishery Districts.

Fishery District	No. of Fish			Quantity			Value		
	1957	1956	1955	1957	1956	1955	1957	1956	1955
				lb.	lb.	lb.	£	£	£
Dublin ...	1,528	1,776	1,020	1,447	1,533	841	258	256	133
Wexford ...	5,755	3,480	4,207	3,837	2,624	2,771	460	408	288
Waterford ...	1,979	1,203	910	1,906	1,204	870	318	171	110
Lismore ...	1,566	581	510	1,740	436	550	337	60	79
Cork ...	9,342	7,961	12,071	6,134	6,644	8,454	1,019	947	1,146
Kerry ...	6,112	10,668	6,425	12,204	12,310	8,000	1,967	2,140	1,171
Limerick ...	2,060	2,362	1,258	1,732	1,965	986	228	303	160
Galway ...	960	2,002	860	1,440	1,747	809	216	279	147
Connemara ...	9,949	10,880	8,842	9,949	10,880	8,842	1,542	1,360	1,106
Ballinakill ...	571	4,124	3,742	636	4,734	2,670	80	734	370
Bangor ...	6,188	5,415	1,963	5,760	4,801	1,997	837	717	296
Ballina ...	1,536	577	158	1,186	549	167	208	73	25
Sligo ...	539	286	74	618	371	131	93	63	19
Ballyshannon	440	527	306	391	553	295	48	80	43
Letterkenny ...	5,010	3,577	4,143	5,029	3,815	3,392	475	576	492
Dundalk ...	724	408	222	628	362	201	85	58	29
Drogheda ...	2,409	1,888	1,073	1,782	1,614	1,309	348	294	217
TOTALS ...	56,468	57,715	46,754	56,575	56,192	42,285	8,517	8,519	5,931

APPENDIX No. 16.

RECEIPTS AND EXPENDITURE OF BOARDS OF CONSERVATORS FOR THE YEAR 1957.

Fishery District	Opening Balance	RECEIPTS						EXPENDITURE					Closing Balance
		Licence Duty	Fishery Rate	Subscriptions	Grant from Exchequer and from Salmon Conservancy Fund	Miscellaneous Receipts	Total Receipts	Water Keepers	Law Costs	Salaries and Commissions	Travelling and Miscellaneous	Total Expenditure	
	£	£	£	£	£	£	£	£	£	£	£	£	£
Dublin ...	167	852	454	42	500	248	2,096	696	102	796	360	1,954	309
Wexford ...	566	1,195	1,266	—	4	8	2,473	1,843	28	237	502	2,610	429
Waterford ...	810	2,442	2,154	—	1,809	277	6,682	3,547	478	1,371	1,772	7,168	324
Lismore ...	1,215	1,406	5,286	—	610	130	7,432	4,604	97	965	1,357	7,113	1,534
Cork ...	702	1,598	694	937	3,407	267	6,903	4,508	127	962	1,274	6,871	734
Kerry ...	1,519	2,001	2,675	—	1,832	181	6,689	3,619	151	1,136	1,244	6,150	2,058
Limerick ...	5,198	2,654	4,544	—	2,011	453	9,662	4,320	434	1,006	3,544	9,304	5,556
Galway ...	1,611	484	2,283	—	107	65	2,939	1,367	—	831	670	2,868	1,682
Connemara ...	305	432	1,724	—	17	7	2,180	1,652	—	257	250	2,159	326
Ballinakill ...	649	291	651	—	—	41	983	855	52	356	219	1,482	150
Bangor ...	695	752	1,107	50	629	195	2,733	1,536	88	456	574	2,654	774
Ballina ...	554	895	3,578	75	115	13	4,676	3,016	12	454	641	4,123	1,107
Sligo ...	925	343	861	—	6	14	1,224	625	6	387	250	1,268	881
Ballyshannon	777	883	1,668*	43	1,116	363	4,013	1,899	—	463	1,130	3,492	1,298
Letterkenny ...	1,369	1,705	1,501†	84	114	124	3,528	1,973	180	631	548	3,332	1,565
Drogheda ...	1,145	1,257	1,245	—	503	28	3,033	2,004	117	538	396	3,055	1,123
Dundalk ...	186	299	365	—	302	2	968	280	104	347	57	788	366
TOTALS ...	18,393	19,489	31,996	1,231	13,082	2,416	68,214	38,434	1,976	11,193	14,788	66,391	20,216

*This figure includes £1,117 received under Section 14 (1) of the Fisheries (Tidal Waters) Act, 1934.
†This figure includes £175 received under Section 14 (1) of the Fisheries (Tidal Waters) Act, 1934.
Sums received by way of Special Local Licence duty which were paid over to the Exchequer in accordance with Section 13 of the Fisheries (Tidal Waters) Act, 1934, are not included in this Table.

APPENDIX No. 17.

PARTICULARS OF LICENCES ISSUED BY BOARDS OF CONSERVATORS FOR THE YEAR 1957.

Fishery District	Salmon Rod				Snap Net	Draft Net	Drift Net	Pole Net	Bag Net	Stake Net	Box or Crib	Gap, Dye or Basket for Eels	Long Lines for Eels	Loop Net	Eel Trap	Special Local Licence (Tidal Waters)
	For one year (£2)	For 14 days (£1)	Issuable at £1 from 1st July onwards	Endorsement or Extension												
Dublin	341	4	59	15	—	9	21	—	—	—	—	—	—	—	—	—
Wexford	230	64	171	85	—	113	—	2	—	—	—	—	—	—	1	—
Waterford	824	22	26	33	104	19	79	—	1	3	3	13	—	—	—	—
Lismore	503	—	—	75	20	12	65	—	—	2	1	—	—	—	—	—
Cork	472	43	198	36	—	71	37	—	—	—	—	—	—	—	—	—
Kerry	349	427	—	119	1	66	—	—	1	—	3	—	—	—	—	—
Limerick	868	1	25	109	—	93	64	—	—	4	4	30	25	—	—	—
Galway	82	35	136	26	—	7	—	—	—	—	5	24	4	—	—	—
Connemara	51	287	—	86	—	—	—	—	—	—	—	—	—	—	—	—
Ballinakill	26	19	147	58	—	11	—	—	—	—	—	—	—	—	—	—
Bangor	140	230	—	90	—	38	1	—	4	—	—	1	—	—	—	—
Ballina	180	134	40	82	—	10	40	—	—	—	7	48	2	—	—	—
Sligo	139	13	—	6	—	6	3	—	1	—	—	—	3	—	—	—
Ballyshannon	124	34	—	93	—	48	3	—	—	—	2	3	2	—	1	8
Letterkenny	516	166	—	268	—	32	46	—	—	—	2	—	—	37	—	11
Drogheda	352	40	—	78	—	100	—	—	—	—	6	2	1	—	4	—
Dundalk	74	—	—	70	—	26	—	—	—	—	—	3	1	—	—	—
													1			
TOTALS	5,471	1,312	802	1,329	125	661	359	2	7	9	33	126	39	37	6	19

APPENDIX No. 18.

Licence Duty payable on the undermentioned fishing engines.

	£	s.	d.
On each Salmon Rod (for full year in one District) ...	2	0	0
Do. Salmon Rod (14 days licence issuable where Board of Conservators so resolves) ...	1	0	0
Do. Salmon Rod (special licence available 1st July to end of season issuable where a Board of Conservators so resolves) ...	1	0	0
Do. Salmon Rod (Endorsement, extending a current licence to another District) ...	0	10	0
Do. Snap Net	2	10	0
Do. Draft Net or Seine	4	0	0
Do. Drift Net	3	0	0
Do. Bag Net	10	0	0
Do. Fly Net	30	0	0
Do. Stake Net	30	0	0
Do. Head Weir	6	0	0
Do. Box or Crib	10	0	0
Do. Gap, Eye, or Basket (in eel weir) ...	2	0	0
Do. Long Line for Eels	2	0	0

On other engines the duty is as follows :—

Fishery District	Pole Net	Loop Net	Eel Trap	Special Local Licences	
				Rod	Draft Net
	£ s.	£ s.	£ s.	£ s.	£ s.
1. Dublin	2 0	—	—	—	—
2. Wexford	2 0	—	—	—	—
3. Waterford	2 0	—	—	—	—
4. Lismore	2 0	—	—	—	—
5. Cork	2 0	—	—	—	—
7. Kerry	2 0	—	—	—	—
8. Limerick	2 0	—	—	—	—
9[1]. Galway	2 0	—	15 0	—	—
9[2]. Connemara	2 0	—	—	—	—
10[1]. Ballinakill	2 0	—	—	—	—
10[2]. Bangor	2 0	—	—	—	—
11. Ballina	2 0	—	—	—	—
12. Sligo	2 0	—	—	—	—
13. Ballyshannon	2 0	—	2 0	*2 0	*40 0
14[1]. Letterkenny	2 0	0 10	—	—	‡12 10
				†2 0	†20 0
17[1]. Drogheda	2 0	0 10	2 0	—	—
17[2]. Dundalk	2 0	—	—	—	—

*River Erne Tidal Waters. †River Lackagh Tidal Waters.

‡River Owenea Tidal Waters.

APPENDIX No. 19.

PUBLIC INQUIRIES HELD DURING THE YEAR 1957.

Date of Inquiry	Where Held	Subject Matter	Decision of Fishery Authority on considering Report of Inquiry
5th February, 1957 ..	Listowel	(1) Alteration of close season for netting in Rivers Feale and Cashen. (2) Regulation of system of draft net fishing in River Feale.	Bye-law not made.
6th February, 1957 ..	Miltown-Malbay ..	Prohibition on fishing in the Annageragh River in the vicinity of the fish pass at the falls in the townlands of Finnor Beg and Molosky.	Bye-law made.
27th March, 1957 ..	Clonmel	Alteration of annual close season for angling for salmon in Waterford Fishery District.	Bye-law not made.
28th March, 1957 ..	Kilkenny		
29th March, 1957 ..	Athy		
23rd May, 1957 ..	Galway	(1) Alteration of annual close season for angling for brown trout in the River Corrib, its lakes and tributaries, but excluding Loughs Corrib and Mask. (2) Prohibition on taking brown trout of less than ten inches in length in Loughs Corrib and Mask.	Bye-laws made.
15th October, 1957 ..	Ennis	Prohibition on use of gaffs as auxiliary to rod and line fishing after 1st May on rivers in Co. Clare (excluding the River Shannon).	Bye-law made prohibiting the use of gaffs from 15th May to the end of the open season in the freshwater portions of the waters of the Limerick Fishery District which flow into the sea on the estuary of the River Shannon between Hags Head and Rineallon Point.
17th October, 1957 ..	Athlone	Alteration of annual close seasons for (1) angling for trout in the River Shannon, its lakes and tributaries north of Portumna and (2) netting for trout in Lough Ree.	Bye-law not made.

APPENDIX No. 20.

ABSTRACT OF ORDERS, BYE-LAWS, ETC., MADE DURING THE YEAR 1957.

STATUTORY INSTRUMENTS.

Fishing Weir Operation (No. 2) Order, 1957, dated 1st January, 1957.

AUTHORISING the Electricity Supply Board to operate without a free gap the fishing weir known as Thomond Weir in the City of Limerick, subject to certain conditions.

Salmon Export Levy Order, 1957, dated 28th May, 1957.

PROHIBITING the export of salmon unless export levy at the prescribed rate has been paid.

Salmon Export Levy Regulations, 1957, dated 28th May, 1957.

PRESCRIBING the rates and manner of payment of levy on salmon exports imposed by the Salmon Export Levy Order, 1957.

BYE-LAWS, ETC.

No. 8 or Limerick District.

Bye-Law No. 493 dated 3rd April, 1957.

PROHIBITING fishing by any means whatsoever in portion of the River Annageeragh, Co. Clare, and possession of any mounted fishing rod and line attached thereto on or near the banks of that portion of the river.

APPENDIX No. 21.

OUTPUT OF SALMON AND TROUT FRY, 1956/'57 (in thousands).

Hatching or Enlarging Station	Where Liberated	Salmon	Sea Trout	Brown Trout
Roundwood ...	Streams into upper Reservoir Bohernabreena.	—	—	21
Bundoody	Slaney	55	—	—
Abbeyleix ...	Nore and tributaries ...	—	—	13
Durrow	Erkina	—	—	7
Paupish	Rivers Burrin, Lerr and Greese	—	—	5
Marlfield	Marlfield Lake	—	—	5
Lismore	Rivers Blackwater, Lee, Tar, Knockaderry reservoir and tributaries, Ballyseanion ...	67	—	45
Mallow	Blackwater, Bride, Clyda, Caithra, Finnow, Awbeg, Glen, Carrig stream, Dromore Lake and Funcheon ...	390	—	110
Clonakilty ...	Argideen	2	2	3
Blackwater (Co. Kerry).	River Blackwater (Kerry) ...	45	—	—
Kenmare	Rivers Clonee and Glennore	75	—	—
Killarney	Killarney Lakes and Rivers ...	36	10	56
Waterville ...	Rivers Finnaglosh, Cummeragh, Carhan and Deole Rivers	20	—	—
Ballinruddery ...	Rivers Feale and Smearla ...	90	—	—
Lough Ennell ...	Lough Ennell, Sheam, Ballyeroy, Co. Mayo	—	—	370
Lough Owel ...	Lough Owel	—	—	203
Longford	River Camlin	—	—	9
Woodlawn ...	Deel Arra	—	—	10
Cranlin (Galway) ...	Cranlin River and Lakes, Kilcolgan River	27	4	—
Loughrea	Lough Rea	—	—	60
Oughterard ...	Lough Corrib	—	—	327
Spiddal	Spiddal River	13	8	—
Inver	Glenturkeen River, Feeder stream to Lough Gowla ...	—	22	—
Screebe	Screebe River	48	19	—
Clifden	Clifden River	—	10	29
Treanlaur	Newport, Skerdagh and Burrishoole Rivers, Keel and Ballycroy	159	21	15
Ballisodare ...	Rivers Arrow and Owenmore, Tanrago River and Oyster beds	149	2	—
Glenear	Bonnet and tributaries, Dillern River and streams flowing into Glenear lake ...	14	6	18
Lough Arrow ...	Ballinafad, Aughagowla, Castle Baldwin and Derrylea Rivers	—	—	12
Clones	Clones Reservoir, River Finn and tributaries	—	—	39
Longstone ...	Callowhill	—	—	17

APPENDIX No. 21—continued.

OUTPUT OF SALMON AND TROUT FRY, 1956/'57 (in thousands).

Hatching or Enlarging Station	Where Liberated	Salmon	Sea Trout	Brown Trout
Glenties	Owenea, Straeashel Rivers, Gweebara, River Poison, Glen and Bunaninver Rivers, Lough Brighde, Lough McHugh and Lough a' Iuban, at Ballinacarriek, County Donegal, Crana River and River Deele	309	48	15
Inniskeen	River Fane, Dee and Glyde, Lough Muckno	29	—	46
Blackcastle ...	Boyne and tributaries, Deel River, Athboy, Enfield, Blackwater, Little Boyne ...	205	—	—
	TOTALS ...	1,733	150	1,435

NOTE.—In addition to the output of fry recorded in the above table for the Lismore, Killarney, Glenties, Lough Owel and Lough Ennell hatcheries, the following quantities of eyed ova were despatched from these hatcheries to other stations and are included in the figures for the latter, viz., from Lismore, 220,000 salmon ova; Killarney, 41,000 salmon ova; Glenties, 701,000 salmon ova and 72,000 sea trout ova; Lough Owel, 299,000 brown trout ova; Lough Ennell, 202,000 brown trout ova.

107,000 salmon ova were hatched at the Lisnatunny hatchery and portion of the fry was liberated in the River Finn.

At its experimental trout farm at Rosetown (near Newbridge, Co. Kildare), the North Kildare Angling Association reared to fingerling stages the fry, resultant from 30,000 brown trout ova, before releasing them.

APPENDIX No. 22.

LIST OF SCIENTIFIC PAPERS, ETC., BY OFFICERS OF THE FISHERIES DIVISION PUBLISHED DURING THE YEAR 1957. (OTHER THAN THOSE PUBLISHED IN THE ANNUAL REPORT).

F. A. GIBSON. "Further specimens of red snake-fish, *Cepola rubescens*, L." *Irish Naturalists' Journal*, xii, 138–9.

———— "*Specimens of Urophycis blennoides* Brunn. taken off Dunmore East, Co. Waterford". *Irish Naturalists' Journal*, xii, 202–3.

ANN HEALY. "Fishes of Lough Rea, Co. Galway, Ireland. 1. Trout and Perch". *Salmon and Trout Magazine*, No 150. May, 1957.

———— "Trout of the River Fergus system, Co. Clare, Ireland." *Salmon and Trout Magazine*, No. 151, September, 1957.

CHARLES MCGRATH. "Report on a study tour of fisheries development in Sweden". Departmental Publication (1957).

EDWARD D. TONER. "Movement of salmon around Ireland VII. From Rath, Co. Kerry (1950–1953)". *Proc. Roy Irish Acad.* 58. B. 15.

EILEEN TWOMEY. "Salmon of the River Shannon (1952–1956)". *Jour. du Conseil*, xxiii.

ARTHUR E. J. WENT. "Notes on the Irish salmon industry (1924 to 1955)". *Jour. Dept. of Agric., Dublin*, 53 (1957).

———— "The pike in Ireland". *Irish Naturalists' Journal*, xii, 178–182.

———— "A further specimen of dusky perch, *Epinephelus gigas* Brunnich from Irish Waters". *Irish Naturalists' Journal*, xii, 202.

———— "Sea trout of the River Ilen". *Salmon and Trout Magazine*, No. 150, May, 1957.

———— "List of Irish fishes". National Museum, Dublin.

———— "Salmon of the River Foyle (1955)". *Foyle Fisheries Commission, 5th Rep.* Appendix IV.

APPENDIX No. 22—continued.

ARTHUR E. J. WENT. "Inland Fisheries" in *A view of Ireland*, published for the British Association for the Advancement of Science, Dublin, 1957.

A. E. J. WENT with E. TWOMEY. "Notes on Irish char, *Salvelinus colii*, Gunther VI". *Irish Naturalists' Journal*, xii, 205–6.

———— with ANN HEALY and K. U. VICKERS. "Tagging programme, 1956". *Foyle Fisheries Commission, 5th Rep.* Appendix III.

APPENDIX No. 23.

STORAGE OF SHELLFISH

By

F. A. Gibson, Ph.D., Fisheries Division.
Department of Lands.

Shell-fish comprise two groups namely *Mollusca* and *Crustacea*. Mollusca, including escallops, oysters, mussels, and cockles, are usually taken in the period from October to May, whereas periwinkles may be gathered all the year round: the period of fishing is largely dictated by a natural close season in the case of escallops, mussels, and oysters since at certain times their flesh may be in poor condition. Crustacea on the other hand, including lobsters, crawfish, Norway lobsters (Dublin Bay prawns), crabs, true prawns and shrimps, are taken mainly from April to November. Fishing for lobsters, crawfish and crabs is only pursued in periods of the year when the weather is comparatively clement, because there is usually a great unavoidable loss of gear during stormy weather. Fishing for Norway lobsters is either incidental to other trawl or sail fishing or takes place during the period April to October when special gear is used.

The problems created by handling and storage of shellfish are greater during the period June to September than during the late autumn, winter and spring. During the latter periods owing to low water temperatures most shellfish are inactive and are, therefore, easier to keep alive and manage in these conditions.

Escallops are sometimes stored and the methods vary considerably. The use of sacks, suspended from quay walls, for storing escallops should be avoided as the escallops are too closely confined within the sacks and, a short time after immersion, the sack fibres swell so that there is little or no circulation of clean water. Escallops must be able to just open their shells if they are to draw in and expel a constant small current of water. This current of water as it comes into the shell carries food particles and the vital oxygen supply for breathing, whilst as it goes out again it carries away with it the waste products of the gut and the deoxygenated water. Escallops quickly foul the water trapped inside the sacks and those that do not die become very weak. Mortality due to this form of storage may not be very great in the sacks, but there may be heavy subsequent mortality during shipment. To some extent this sort of loss due to storage may be lessened by using close mesh (1 inch) sisal net bags. The meshes allow a constant circulation of sea-water amongst the escallops, which thus remain healthier. The sisal mesh bag takes considerable time to make

and repair and many are needed if fishing is heavy. Furthermore, escallops may become so tightly packed that little or no movement is possible within the bags, as is the case with sacks. Ideally, some other method of storage should be practised which will allow the escallops to move about and receive a plentiful supply of fresh sea-water. This can be done by constructing holding ponds. For example, in a sheltered inlet the natural rock formation near high-water mark can be walled off in cement, leaving a sluice or bung-hole so that the water at low tide may be drained away from the pond. The wall should not rise above high-water mark, so that as much use of the tide can be made as possible for circulating water through the pond. It is essential, however, to put some suitable form of fencing on top of the wall reaching well above high water mark, because escallops are good swimmers and can easily escape over a low wall. The pond need not be very large. The size required may be calculated according to the number of escallops which will be handled—on the basis that every square foot at the bottom will hold between 12 and 20 escallops. A pond measuring 20 ft. by 15 ft. will, therefore, accommodate between 300 and 500 dozen escallops. The ponds described for escallops would have obvious uses for mussels, cockles or oysters where these shell-fish have to be held for a few days prior to marketing. They would be of no use for periwinkles which would escape from them, nor for crabs, lobsters, craw-fish, etc., for which they would be too small. Their great advantage for escallops is that they keep the shell-fish in excellent condition until required for market, which is not done by the other methods mentioned.

Mussels, cockles and oysters may be purified by operating a relatively simple tank technique. For this purpose it is essential to have cement rendered tanks. The dimensions of these tanks are largely a matter of choice. Baird (1954) recommends 3 tanks measuring 5 ft. 6 inches by 6 ft. 6 inches by 1 ft. 6 inches in depth, with a capacity of 297 gallons each for the serving of which a water storage tank containing about 2,000 gallons is required. In each treatment tank wooden slotted grids are placed on the bottom, leaving just enough space at the edges so that they may be easily lifted. The grids have the function of allowing the waste products of the shell-fish, *viz.* sand, mud, excretia, shell chippings, etc., to fall to the bottom, where they will not come into contact with the shell-fish again and can be hosed away subsequent to treatment. A 1½ inch centrifugal pump is sufficient to fill the storage tank for this number of tanks. The storage tank is at a higher level than the treatment tanks which are fed from it by gravity. The outlets from the treatment tanks should be at least 6 inch porcelain pipes, so that all the sediment can be freely washed out of the tanks. The procedure to be adopted for purifying the shell-fish is briefly as follows. The storage tank is filled with water and sterilised by adding chlorine at the rate of 3 parts per million of sea-water,

and allowing it to stand for 12 hours. The chlorine is then neutralised by adding sodium thiosulphate (Hypo). The shell-fish are immersed in this sterilised and chlorine free water and having lain in it for 24 hours are hosed down with sterilised seawater to remove excess wastes. The process is then repeated in a second bath of seawater sterilized in exactly the same way. The shell fish function normally in the sterilized water, with the result that they filter out of their system, any waste products likely to contain harmful matter. At the end of the second bath the shellfish are bathed with chlorinated but not neutralized seawater. This causes them to close their shells and cease to function, so that the shells themselves become sterilized. Thus both the insides and the outsides of the shell-fish are sterilized. Each bath in sterilized seawater should continue for 24 hours and the final, chlorine only, treatment for sterilizing the shells should last for 2 hours.

It is well to note that during cold weather, when the water temperatures go as low as 5 degrees C., oysters become very inactive, and they do not filter normally, though they are in no wise less polluted. Provision may have to be made during such cold conditions, therefore, to bring the water temperature up to as much as 15 degrees C. Water with a specific gravity below 1·022 at 15 degrees C. should not be used for oysters and cockles, nor below 1·016 at 15 degrees C for mussels (Baird, 1954). This type of tank is geared to cleanse about 5,000 oysters per week, or about 1 ton of mussels during the same period. It is therefore designed for the private individual dealing with his own catch. For collective purchasing of course the tanks require to be enlarged to the size necessary to cope with the landings and will probably necessitate the introduction of a chlorination tank between the storage tank and treatment tanks.

Commercial forms of chlorine may be obtained. A solution of 3 parts per million will require 27·24 ccs. of commercial chlorine to every 100 gallons of seawater.

The most convenient method of mixing the commercial chlorine with the storage tank water is to allow it to drip steadily on the inflowing seawater passing from the storage tank into the chlorination tank. In order to make certain of neutralising all the chlorine in the water, before it enters the treatment tanks, it is necessary to make up a solution of Hypo at the rate of one pound to each gallon of water. Three-quarters of a pint of this solution will be sufficient to neutralise the chlorine in each hundred gallons of water. The Hypo is most efficiently mixed with the sterilised water by allowing it to drip steadily into the water flowing from the chlorination tank to the treatment tanks. It is advisable to take the water supply for the storage tank at high tide when there is every chance that clean well-aerated water will be available. The shellfish must be scrubbed free of excess mud, sand, barnacles, chippings, etc., and well hosed down before being placed in the tanks.

Periwinkles are not often stored in ponds because it is commonly believed that this hardy species is unaffected by being unnaturally confined in sacks. Over short periods this is correct but when longer holding periods are involved and indeed even if they are not a pond is a much superior method. A small pond, with sides well above high-water (by at least 2 ft.) through which the tide may flow via mesh-covered sluices has the great advantage of being able to keep the periwinkles in it in perfect condition over extended periods. Periwinkles are not so easily killed by very low or high temperatures and their oxygen requirements are not great. They exist under conditions which could not be tolerated by any other shellfish. Periwinkle ponds, which should be capable of being drained, serve another purpose. Live and graded periwinkles may be selected from them and the value of this may offset the expense involved in working the pond.

It is generally believed that the mollusca are much hardier than the crustacea and that they will tolerate abuse and bad conditions. Whilst this may be true to a limited extent it must not be forgotten when they are fished off their natural ground they automatically become subject to unnatural conditions. Every effort to help them to survive without distress under such conditions will improve their market quality. Care taken with mollusca will certainly be amply repaid.

Because crustacea are, on the whole, more delicate than the mollusca, holding them involves many difficulties. Crustacea must in many cases be held before marketing and their sensitivity to the unnatural conditions of captivity must be closely studied if losses are to be avoided. Good *storage for lobsters* is essential. Fishermen should, of course, handle their lobsters in the manner set out by this Department in the "Hints to Fishermen" so that the lobsters may reach the storage facilities in good condition. The four main factors which govern lobster storage are :—

(1) The salt concentration of the water in which they are stored (Salinity).

(2) Their numbers per given area (Concentration).

(3) The oxygen content of water, and

(4) The temperature of the water.

Of these four factors, by far the most important is the salinity of the water. Lobsters cannot survive the effect of fresh water which must therefore be avoided at all costs. Short heavy deluges of rain-water suddenly swell the rivers and the water runs off quickly to the sea. This fresh water can often be seen as a brownish layer lying on top of the sea-water. It is lethal to lobsters and when fishermen see it they must either take the lobsters to another area unaffected by it or pack their catch off to market. They may, where possible sink the catch at least 12 ft. below the surface and as far away from the shore as possible

thus avoiding the effect of this layer. Similarly ponds must be constructed so as to divert any run-off fresh water. Rain water run off from the land even in tiny rivulets may cause local admixture of fresh and salt water in the ponds which will kill lobsters which come under its influence. Rain water dropping on to the ponds is usually not harmful. Under normal conditions the tide provides water of the salinity needed by lobsters.

The second most important condition is concentration. Overstocking an enclosed area with lobsters causes mortality within a few days. The maximum density for safe handling appears to be about 1 lb. of lobster to each gallon of water (1 cubic ft. = 6¼ gallons). A volume enclosed by 3 ft. by 4 ft. by 2 ft., i.e. 24 cubic ft. will contain 150 gallons of water, which is usually just about enough to hold 150 lbs. weight of lobsters, say about 9 dozen. Except for very short periods it is unwise to exceed this density and the lower the concentration the better. Assuming that seawater of suitable salinity is available (a specific gravity of 1·022 at 15 degrees C. = a salinity of approximately 2·8%, which is the minimum to which lobsters should be subjected) and correct concentration ratios are observed, there remain the factors of oxygen and temperature. These are also of great importance. For the fishermen using floating keep boxes they are of importance because, during very calm weather when there is little tidal movement, the upper layers of the water may become denuded of oxygen when the temperatures rise considerably. Where feasible the fishermen should avoid these adverse conditions by sinking the catch some 12 ft. below the surface where the water is cooler. In ponds, however, the oxygen and temperature requirements must be provided by artificial means. It is, therefore, essential that oxygen be introduced into the ponds and that the air over the ponds and where possible pond water itself be kept cool. When water warms, its ability to absorb oxygen is drastically reduced. Provision must be made to replace the oxygen artificially. Oxygen can be introduced into the water by forcing air bubbles through it. The bubbles must be minute. Large bubbles having large surfaces and great buoyancy release their oxygen slowly and rise rapidly to the surface where they explode and most of the oxygen contained in them is dissipated into the atmosphere and not taken up by the water. If the bubbles are "atomised" under pressure it will be found that they appear in the water as a milky-looking fluid which floats lazily to the surface. Their surfaces release the trapped oxygen readily. In order to atomise the bubbles a venturi valve is needed in which the air and water are mixed and forced into the water at the pressure needed to distribute the oxygen throughout the ponds at the rate of aeration required by the lobsters within the area where they are being held. The remaining question of temperature is a very difficult one. Every effort should be made to protect the pond water from the direct rays of the sun, and to that end a roof over the pond

painted white on the outside will tend to reflect heat away from the pond enclosure and the water. During hot weather it is advisable also to draw a current of air across the surface of the water in the ponds by the use of extractor fans. The current of air will have the effect of increasing the rate of evaporation and, therefore, help to reduce the temperature. Seawater often reaches a temperature of over 15·5°C. especially at low water during the late summer and early autumn. At such temperatures lobsters will be weakened and mortality will occur. The ideal temperature range for summer storage lies between 8·3°–12·8°C.

Three main holding methods are employed in this country, namely, (*a*) floating boxes, (*b*) controlled tidal pounds and (*c*) shore-based ponds. The floating boxes are in many sizes with capacities varying from a few dozen to upwards of 200 dozen of lobsters or crawfish. Floating boxes, wherever situated, should be considered only for temporary storage except during the colder seasons when heavy losses in them are not likely to occur. Tidal ponds consist of suitably walled off areas of foreshore within which large quantities of lobsters may be held. Such ponds must be situated upon an open shoreline where the surface seawater is unaffected by fresh water. The concentration of lobsters in these ponds is often as low as 1 lb. per 10 gallons of water. The inflow of seawater to the pond is controlled by a sluice situated at a point on the bottom of the pond walls so that in spring tides the water may be completely drained out. During slack (neap) tides therefore the pond cannot be drained completely, and it is at such times when there is no more than a foot or two depth of sluggish water covering lobsters that extreme care must be taken to avoid heavy mortality. Large scale aeration is advisable in these circumstances. A pond of this kind has the disadvantage that the state of the tide controls the time at which lobsters may be taken out of it for packing. Lobsters freely move about these ponds and it is, therefore, almost impossible to separate lobsters introduced at different times. Another disadvantage is that it is impossible to grade the lobsters within the ponds which causes considerable difficulty when selecting lobsters for shipment. In tidal ponds certain physical properties of the water undergo daily fluctuations. In any one day the temperature range may be from 13·9° to 17·2°C. whilst the oxygen content during the same period may range from 2·0 to 7·0 (approx.) ccs of dissolved oxygen per litre. Constant alteration of the temperature and the oxygen content causes lobsters to alter their physiology in order to cope with the changing environment. This weakens them and accumulative effect often produces heavy mortality.

It is suggested that tidal ponds are most suited to crawfish but shore-based ponds represent a progressive step in lobster storage. These ponds have their water requirements pumped

from the sea direct thereby becoming independent of the tides. They should be divided into sections called units, each of which is capable of holding not more than 800 lbs. weight of lobsters. Each unit should have a separate drainage outlet so that it may be completely emptied to facilitate collection and packing. Drainage may be effected in several ways, and the simplest of which would appear to be as follows. If the outflow is located centrally on the floor of each unit and the amount of water passing out this way via piping controlled, then, when desired, the inflow can be stopped and the unit drained. Water and air should be introduced into each unit under pressure so that there is a mechanical distribution of the air throughout the upper and lower layers of the water and at the same time the water supply is circulated within the unit. This circulation will be improved if the four corners of the unit are rounded. Pockets of dead water collect in right angled corners where lobsters also tend to congregate and where some of them will suffocate from oxygen shortage. Air may be introduced to the water by the methods described on page 55.

The pumping arrangements are most important. The further the source of pumping from the ponds the greater the cost of pumping. It is obviously desirable to choose a site adjacent to a constant supply of pure seawater. If this is not possible, then a separate pump-house should be built as near the source of seawater as possible, from which the water may be driven to the pond. It is advisable to have a spare pump to cope with emergencies. At certain times the seawater at its pumping source may become too warm or it may become fouled due to bad weather conditions. In such circumstances it will be necessary to re-circulate the water within the pond. The rate of flow, either during direct or re-circulated pumping, should be such as will allow the water in the units to be completely changed in not more than 6 hours. Re-circulation is made possible by having a sump or small reservoir built at one end of the pond.

It is possible by the use of shore-based pond units to establish a rotation whereby healthy lobsters may be selected and shipped in good condition. Grading of the various sizes and condition of lobsters is also possible, and shipments can be carried out more quickly and with considerably less handling. *The less lobsters are handled the better.* Over-handling and mishandling together cause at least 80% of the crippled lobsters found in storage.

It has been found that lobsters die quickly if they remain even for a short time in water which is neither being circulated nor aerated. This is due to the fact that lobsters only occupy the lowest 3 to 4 inches of the water within the ponds, which they quickly denude of oxygen if the water remains stationary. The oxygen in the upper layers, diffuses too slowly to the lower layers and the lobsters' oxygen requirements are not met.

Therefore, great care must be taken to ensure that automatic draining device is included which will come into operation should the pumping power fail, in such a way that all the seawater will drain off the lobsters. It will be found to be even better if this drain can be arrested automatically when not more than one half inch of water remains on the bottom of the pond. Lobsters can live for a considerable period in the moist atmosphere provided for them by this quantity of water, though this is not a recommended practice for normal storage procedure. When no more than ½ inch of water remains on the bottom of the pond it is unlikely that any serious quantities of this water will actually touch the gills of the lobster. The lobster will receive its supply of oxygen from the moist air caused by the evaporation of the thin layer of water on the bottom of the unit. The inside facings of each unit ought to be treated with a substance which will produce an absolutely smooth finish, so that the minimum amount of damage will be done to the lobsters as they move about, especially during long-term storage. Care must be taken to ensure that the substance used for this purpose is absolutely non-toxic to the lobsters. A central walk-way giving access to the units will greatly facilitate the introduction and extraction of lobsters. It is evident from this description that a shore-based pond is not an undertaking to be considered lightly. It is costly to construct, and requires considerable technical skill to operate. The advantages arising from its operation are many and obvious and the working margin of losses especially with lobsters ought to be considerably less than those experienced with other methods. The advantages of shore-based ponds do not stop with lobsters. Quite obviously they can be successfully used to store escallops during the season, or to cleanse oysters, mussels and cockles should this be required. There are probably a very great many uses to which such ponds may be put which could be discovered with practice of using them.

Generally speaking *crawfish* may be stored in exactly the same manner as described for lobsters though as mentioned open sea ponds appear to suit them much better than the confined limits of shorebased ponds. *Norway lobsters* have not been stored alive successfully so far as is known at present.

Crab storage cannot be carried out as described for lobsters or crawfish. Crabs will fight and be killed in great numbers if they are stored in such a way as allows them complete freedom of movement. Crabs cannot be stored for long periods ; in fact it is unwise to exceed 48 hours storage. The best method of holding crabs appears to be to pack them tighly into strong boxes of suitable sizes. For example, a strengthened 5 st. fish box with regular holes bored in its sides. floated in pure seawater, will hold crabs efficiently for 48 hours if they are packed tightly legs downwards and of course always kept away from the source of any form of pollution.

Prawns (i.e. true prawns) sometimes called shrimps in Ireland. may be held in floating boxes in pure seawater for periods up to 3 days without loss. Galvanised square mesh wire (⅛ inch) is preferable to holes bored along the sides of the boxes. The wire mesh allows free circulation of water into and out of the box. Each box of the size of a 5 stone fish box will hold up to 20 lbs. weight of prawns. Prawns need only be held where insufficient quantities of them are available to make daily shipments worthwhile.

The scientific names of the shellfish mentioned in this paper are as follows :—

Common Name	Scientific Name
Oyster.	*Ostrea edulis.*
Escallop.	*Pecten maximus.*
Mussel.	*Mytilus edulis.*
Cockle.	*Cardium edule.*
Periwinkle.	*Littorina littorea.*
Lobster.	*Homarus vulgaris.*
Crawfish (spiny lobster).	*Palinurus vulgaris.*
Norway Lobster (Dublin Bay Prawns).	*Nephrops norvegicus.*
Crab.	*Cancer pagurus.*
Prawn.	*Leander serratus.*

APPENDIX No. 24.

ESCALLOP FISHING AROUND IRELAND

By

F. A. GIBSON, PH.D., Fisheries Division,
Department of Lands.

There are, at present, two main centres of escallop fishing around the Irish coasts, one situated in the inlets forming the north side of Galway Bay, and the other along the south-west coast from Schull, County Cork, to Valentia, County Kerry. The beds exploited in these areas are all inshore, ranging from a short distance to about two miles beyond low water mark and in depths varying from two to twenty fathoms. Extensive beds are uncommon, most of them being small and located between rocky areas where the bottom is suitable. Escallops are generally taken in the months of October to April. Minimum size limits are enforced.

The escallop is a *mollusc* which has two valves forming its calcareous shell (as distinct from, for example, other *molluscs* such as periwinkles which have only one valve). The upper valve of the escallop is formed by a fairly flat shell, while that of the lower valve is saucer shaped. In its natural feeding position the escallop remains embedded in such a way that the flat valve is at exactly the same level as the surrounding mud or sand. A fine layer of silt becomes deposited upon the flat valve, and this acts as a very effective camouflage of the escallop's exact position. Although escallops of all sizes can swim quite vigorously, it is only on rare occasions that they can be induced to do so. Even then they only swim for very short distances before settling down again and reclosing their valves tightly. They appear to swim short distances in order to avoid the slow-moving starfish which is one of their most serious predators. Of almost 1,000 escallops of ages varying from one to over seven years which were effectively tagged during experimental work carried out by this Department in 1952 and 1953, a total of 280 were recaptured up to the end of 1957. All, with one exception, were taken on the same beds on to which they had been released as much as five years previously.

By the action of numerous special threadlike processes called *cilli*, water is drawn into, and later expelled from, the shell cavity. The inhalant current brings with it fresh supplies of water for breathing and food particles which are transported to the mouth by the rhythmic motions of the *cilli*. The exhalant current bears with it the unused food and other particles, and also the waste products of digestion and breathing. Escallops utilise relatively large quantities of food, in the form of plankton (tiny organisms found in sea water) and detritus, i.e. lifeless

material. If the flat valve of an escallop is cleaned and examined it will be seen to bear a series of concentric rings or furrows. These are laid down each year between October and March. During this part of the year little or no growth is made because sea temperatures decrease to their lowest, the escallop becomes inactive, and the food supply becomes scarce, so that the rate of feeding is at a minimum. A ring or check in the growth rate is formed annually which indicates this period of almost total cessation of growth. In many cases the width of this ring is no more than 1/32nd part of an inch. By counting the number of these rings on the flat valve, therefore, the age of any particular escallop may be determined. The distance between each ring and the next represents for all practical purposes, the fast growth rate made from April to September, when conditions for feeding attain their best. During the first five or six years growth is rapid. Thereafter it diminishes so that, for example, after the eighth or ninth winter as little as one-eighth of an inch of growth may be made during the following summer. Between three and four and a half years of age, escallops in Irish waters grow approximately to a size of four and a half inches along their greatest length. At this age they will have spawned at least once. The purpose of the minimum size limit for escallops is to ensure that those below this size shall be able to contribute to the general spawning effort at least once before they enter the commercial fishery. The male and female parts of each escallop are combined within one region which is known as the *gonad*, and popularly called the " tongue ". The male part of the " tongue " is white or ivory, and the female a bright pink or red, when the escallop is ripe or " full ". This organ is the yardstick used on the market to determine quality for the purpose of sale in the shell. When the gonad is firm and brightly coloured, escallops are said to be of good quality. There is little demand in European markets for escallops with colourless and flaccid gonads, although this may not hold for American markets where the gonad must in any case be removed before presentation. During the late spring or early summer, and again in early autumn, the ripe eggs are extruded from the female part of the gonad. They are fertilised by the male elements which usually ripen first. The fertilised eggs quickly develop into free-swimming minute creatures called *veliger larvae*. After a short free-swimming life, they settle down and, providing that they come to rest on suitable bottom, quickly change their shape and take on that of miniatures of the adults. Vast numbers of eggs are produced by each escallop, and this is nature's device to ensure that at least an essential proportion of them have a reasonable chance to survive and become adults.

This résumé of the natural history of the escallop is related in order to emphasise the speed of growth from birth to marketable size and, therefore, the value and gain of returning to the beds all small escallops caught while dredging. It also illustrates

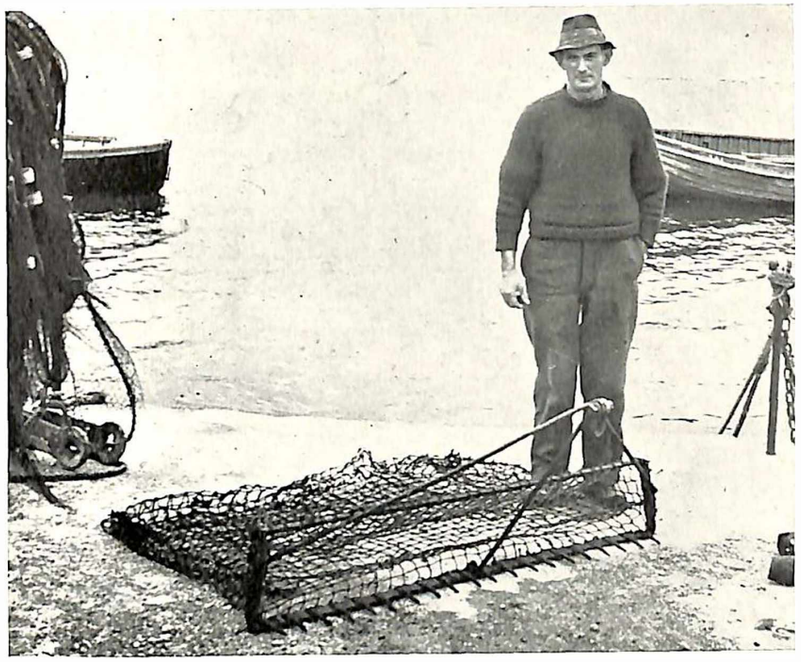
that the escallop, though capable of swimming, is more or less sedentary in its adult life. All sizes of escallops are found associated together in the same beds so that there is every chance that the small or under-sized ones which are returned from the catch to the sea may be relocated in the same beds into which they were released. As has been shown by experiments carried out by this Department, movements of half a mile are exceptional. It is probable that the juvenile escallops settle down on particular beds where they remain for the rest of their lives.

There are two main methods employed for capturing escallops in Irish waters, mainly (1) by brideog or long-poled hand net, and (2) by dredging. A brideog consists of a young larch or similar kind of pole, to one end of which is firmly lashed an eight inch diameter metal ring. The pole is usually not less than twenty feet long. A small meshing bag is lashed to the metal ring. On calm clear days the escallops are "shaded". The brideog operator searches the bottom by peering through a cutaway biscuit tin, or other "shading" contrivance, and when he observes the white gleam produced by the overlap of the round upon the flat valve of an escallop, the brideog is lowered to it and the metal ring is used to tip the escallop out of its seating, over the rim of the ring and into the bag. This method of fishing produces large numbers of escallops but it is so dependent upon the state of the tide and clemency of the weather that it cannot often be practised.

Two variations of the one design of traditional Irish escallop dredge are commonly used, the larger on the south coast and the smaller on the west coast (plates Ia and b). These dredges consist basically of rectangular frameworks varying from 3 ft. 6 inches to 5 ft. 6 inches in length. Three rigid bridles are welded to this frame, and they meet in an apex forward, the ends of which are welded together, and linked by a metal ring or eye for towing purposes. The lower side of the framework is a straight edge to which teeth are firmly riveted. The teeth are usually made of mild steel and seldom buckle on rough ground. Each tooth is about $3\frac{1}{2}$ inches in length and set at $2\frac{1}{2}$ to 3 inch intervals, at an angle of approximately 45° to the plane of the bridles. A sisal net bag, attached to the back of the frame, completes the picture. At least three methods are employed to operate the traditional Irish dredges. These are:—

(*a*) by sail and row boat,
(*b*) by anchor line and winch,
(*c*) by motor power.

The combined power of wind and tide and the use of sail is sometimes still employed to tow the dredge along fairly solid bottom. The second method uses a special dredge boat which drops anchor and, moving off, pays out about one hundred fathoms or more of anchor line. The dredge is then shot and towed along the bottom by pulling it against the strain main-



a

b

c

Plate. 1. Traditional dredges used on (*a*) South coast and (*b*) West coast. (*c*) Sledge dredge.

tained by the anchor rope. A small hand winch is often mounted amidships for this purpose. A small engine can also be put aboard to do the work of the hand winch. Dredging by motor power, not being dependent upon weather (to anything like the extent of hand dredging) enables a very much more extensive and varied area to be fished. Motor power allows for greater fishing effort which in turn produces greater quantities of escallops. Another advantage of motor power is that it is possible to undertake prolonged and uninterrupted tows and therefore to operate in deeper water where escallops may be more plentiful. Using the manual methods described for (*b*) above, a good daily yield of escallops in Irish waters is about thirty dozen per day. The smaller cost of hand power compared with motor power, is offset by an increase in yield of at least 50% from power dredging. To further increase the efficiency of power dredges, the British Ministry of Agriculture, Fisheries and Foods Experiment Station at Conway, North Wales have devised a sledge dredge (plate 1c). A slightly modified version of this dredge has been used experimentally in Irish waters. The results of these experiments, made in April, 1955, showed the remarkable manœuvrability of this new dredge and illustrated the ease with which a small boat can tow it along the bottom. The sledge dredge was also found to be significantly more productive of commercial-sized escallops than a traditional Irish dredge of southern design which was tested against it. Mr. R. H. Baird of the Fisheries Experiment Station at Conway, North Wales, using a frogman's outfit, observed the action of a traditional Irish dredge of southern design, and found that it proceeded along the bottom in a series of long shallow leaps, and that the amount of bottom untouched during these leaps consisted of as much as 80% of the total distance covered by each tow. This action would be equally typical of a dredge of western design. The " feel " of a tow rope from a traditional Irish dredge consists of a series of jerky alternate tightening and slackening of the tension on it. This is caused when the teeth dig into the sea bottom and thus build up a series of heaps of bottom material in their path from which the dredge must escape by leaping through the water when the tension on the tow rope becomes too great. However, the runners or skids of the sledge dredge (plate 1c) slide along the bottom and prevent the teeth from " digging in " to a depth of more than three-quarters of an inch. This avoids the building up of heaps of bottom material, with the result that the dredge remains on the bottom for almost the whole of the length of a tow. The increase in working efficiency resulting from this is quite clear.

It has been observed that one of the only conditions under which the sledge dredge will not operate as efficiently as it ought to is when the bottom of the sea consists of a series of ridges. On such a bottom the sledge dredge passes over the crests of the ridges, and is thus prevented from taking any escallops which are

located in the hollows between the ridges. This bottom condition, however, does not occur very often where escallops are plentiful.

The sledge dredge is maintained on the bottom by a diving plate (plate 1c) which exposes its surface to the downward thrust and pressure of water. This force increases proportionally to the depth. The diving plate is shaped on the style of an anoplane, so that when the dredge is being shot, water may pass either under or over the plate. Thus this ensures that, properly handled, the sledge dredge will not somersault during shooting, and will therefore reach the bottom with the teeth in their fishing position. A sledge dredge will be found to be most conveniently shot from the stern of the boat and preferably by using a derrick. In order to ensure that the dredge will arrive on the bottom in its correct fishing position it is advisable to reduce speed to very slow ahead as the dredge is being shot, and not to check it during its descent. As soon as the dredge touches bottom, the towing warp or hawser is then checked and the engine of the boat set at slow ahead. If it is desired to increase the speed of dredging, then additional warp must be paid out in order to avoid what is termed positive lift, which will have the effect of lifting the dredge completely off the bottom. A small boat with a 10/12 H.P. inboard engine is capable of towing at least two sledge dredges which have a five-foot tooth bar, without undue wear and tear on the engine. However, a small winch or capstan is necessary to bring the dredge alongside conveniently. With knowledge of fishable areas, fishermen could utilise the sledge dredge more effectively than the traditional Irish dredge, and they could use it for fishing in restricted areas more productively. It is preferable to use wire hawser instead of rope warps. The hawser, by its own weight in water, lies concavely out and downwards from the boat during towing, with the result that a dredge is pulled along the bottom and parallel with it. On the other hand, rope warp is supported by water, and therefore lies convexly out from the boat, and thus tends to pull a dredge off the bottom. However, by using an aftertow position on the sledge dredge it is possible to use rope warp with reasonable success. (Plate 1c at X).

Research work done by this Department together with much information supplied by many Irish fishermen, has shown that the escallop is very widely distributed around our coasts, in areas both inshore and offshore where as yet they have not been exploited. Inshore beds probably exist in very sandy bays or inlets on all coasts, though escallops are not necessarily there in commercial quantities. There are also clear indications that escallops are found well offshore from the Counties Wexford, Waterford and Cork, and to a considerable extent along the fishing banks from Kish to Clogherhead on the east coast. Normally escallops are dispatched to market in the shell, packed in sacks. They travel reasonably well in cool weather, though frost kills them quickly, and they are weakened during warm

weather. In recent years large quantities of escallops have been processed in Ireland prior to their export. In other countries (especially Tasmania, U.S.A. and Newfoundland) escallops are usually deshelled and cleaned aboard the boat. This is, of course, only practicable if they are iced during fishing operations, and where freezing facilities are convenient to the landing places. Motor powered dredges, during long tows, provide time in which to deshell the catch by opening, cleaning and packing the washed meats into well iced containers.

The following description of the method of cleaning escallops will be found useful. Each escallop is opened by holding it tightly in the palm of the hand with the flat valve uppermost. An oyster—or similar—strong knife is inserted through the space which will be found between the two valves at the "ears". The end of the knife is incisively moved in the direction of the outer edge of the shell so that the upper valve is cleanly cut free of the muscle attached to it. When the free upper valve is removed, the escallop will be found lying inside the round valve. The beard, orange-coloured gills, black digestive gland and the gut surrounding the muscle are removed with the aid of the fingers, a knife or a pair of scissors, taking *great care* not to remove the "tongue" from the muscle in doing so. The remaining meat and "tongue", after careful washing, must be cleanly cut out and scraped clear, taking care not to leave behind any of the meat. It is drained of excess liquid and stored away in iced containers. Approximately twenty pounds weight of ice should be used to keep the meats extracted from each 30 dozen of escallops in a sufficiently cool state so as to be presentable for freezing purposes ashore.

APPENDIX No. 25.

INVESTIGATIONS INTO THE MOVEMENTS OF SALMON AROUND IRELAND

By

ARTHUR E. J. WENT, D.Sc., Inspector and Scientific Adviser, Fisheries Division, Department of Lands.

In 1948 as part of a scheme, agreed upon at an annual conference of the International Council for the Exploration of the Sea, to investigate the movements of salmon along the coasts of Western Europe, tagging of clean salmon in the open sea around Ireland was started. Tagging stations were operated at Achill, Co. Mayo; Baginbun, Co. Wexford; Carnlough, Portbraddan, Portrush, Carrick-a-rede and Portballintrae, Co. Antrim; Rath, Co. Kerry; Streedagh, Co. Sligo and from drift nets used along the Donegal coast. In 1958 operations were started at Ardmore, Co. Waterford, but as they are still in progress it is proposed to leave them out of consideration in this paper, which is intended to give a summary in simple form of our findings as a result of the experiments which have been completed to date. Those who desire to have full details of these experiments are referred to the list of references given at the end of this paper. Details of tagging of clean fish in the estuaries of such rivers as the Shannon and Foyle have also purposely been left out of consideration here.

In future it is intended to initiate tagging of salmon in the open sea at stations, other than those mentioned above, but as the choice of any particular station will depend upon many factors, it is not at present feasible to list the stations where operations may be carried out in the future. The aim will be to establish eventually sufficient stations to give reasonable coverage for the whole of the coastline of Ireland.

The experiments along the coast of Co. Antrim were carried out by officers of the Ministry of Commerce, Belfast, in collaboration with officers of the then Fisheries Branch of the Department of Agriculture. Officers of the Ministry of Agriculture and Fisheries, London, took part in certain of these experiments as also did a number of voluntary helpers as already acknowledged in the respective papers listed as references.

In these experiments the Lea hydrostatic tag was used and it was attached to the body of the fish at the base of the dorsal fin by means of stainless steel wire. The Lea hydrostatic tag consists of a transparent celluloid tube, sealed at both ends with blue plugs, also of celluloid, and containing a message printed on thin paper. From the outside the words "Cut ends. Letter inside. Reward" and a serial number and possibly an index letter, can be seen. The messages have varied somewhat over

the years but they all invite the captor of a fish bearing a tag to return the tag, with relevant particulars of the fish, to a specified address.

As fishermen, whether they be netsmen or anglers, have been very co-operative, a vast amount of information has been collected from these experiments and we have been able to follow not only the movements of salmon around the Irish coast but also to obtain some information as to the speeds of travel, etc.

In all 4,198 salmon (which term is intended to include grilse) were tagged and released alive and 1,074 tags have been recovered, being 25·6% of the number of fish tagged. There were, however, great variations in the proportion of fish recaptured from taggings at the different centres as can be seen from the final column of Table 1. It is perhaps as well to say at this juncture that the low proportion of recoveries of the fish taken by, and released, from the drift nets along the Donegal coast was not unexpected because the method of fishing itself is such that fish are very much abused. Therefore it was expected that recoveries would be low when compared with those taken by other methods. This does not apply to the fish tagged at Streedagh, which were taken mainly in a bag net and despite more satisfactory handling, the proportion of recoveries, for some unknown reason, was exceedingly low.

In a large number of returns made in connection with tagged fish the method of recapture was either given or could be established without difficulty. As will be seen from Table 2 the bulk of the recaptures of tagged fish were made in draft nets, which provide, of course, the most important commercial method of taking salmon in Ireland to-day. For example, as is shown in the Department's *Annual Report* for 1957 (page 15) 55·8% of the total catch of salmon in that year was made by this method. The proportion of recoveries of fish retaken in bag nets was high along the Co. Antrim coast where a fairly large number of these engines operate, whereas it was comparatively low from the other stations near which bag nets are few in number. The high proportion of fish tagged at Baginbun, recaptured in drift nets, and by methods described in Table 2 as "other methods", can also be attributed to the fact that large numbers of salmon tagged at this centre were recaptured in Waterford harbour and the estuary of the Blackwater in which large numbers of estuarine drift nets, snap nets and weirs are used. The proportion of fish retaken on rod and line (11·9%) is probably somewhat less than that for the country as a whole to-day. As will be seen from the Department's *Annual Report* (Fisheries) for 1957 (page 15) the figure for that year was 17·2%. Since the war, however, there has been a steady rise in the proportion of fish taken on rod and line, mainly due to the increase in the number of people fishing, but the figure given in Table 2 was probably reasonably representative of the period when the experiments were conducted.

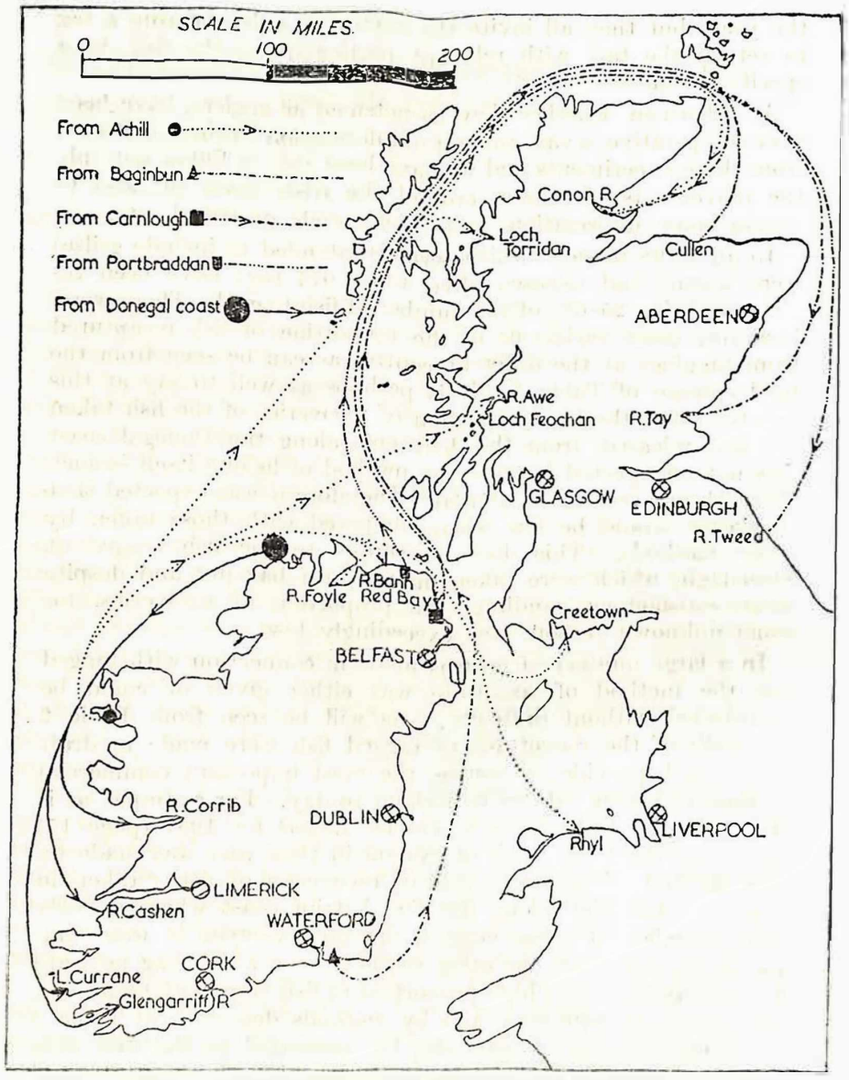


Fig. 1.—Sketch map showing long distance migrations (upwards of 200 miles) of salmon recorded in these experiments.

The time at liberty of the tagged fish before recapture was also noted in the majority of cases, and approximately half of all the fish tagged were retaken within 10 days (Table 3). Almost another quarter were retaken within 20 days and about an eighth within 30 days. In other words, of the fish which are recaptured, nine-tenths will be taken within a month of arriving in the Irish coastal waters. Most of the fish which evaded capture for 30 days or upwards were retaken on rod and line.

The shortest distance between the place of recapture and the tagging station was calculated for all fish for which data was available. Taking the stations together almost three-quarters of the recaptured tagged fish had travelled less than 50 miles and a further fifth between 50–100 miles. In other words only 5% of the tagged fish had travelled more than 100 miles before being recaptured. In all only 17 fish are recorded as having travelled upwards of 200 miles and the details of these fish are as follows :—

Tagging Station	Place of recapture	Distance Travelled (miles)
Achill	Foyle (2 fish)	213—217
,, ...	Red Bay	230
,, ...	Loch Feochan	255
,, ...	R. Awe	284
,, ...	Creetown	361
,, ...	Outer Loch Torridan ...	463
,, ...	Rhyl	474
,, ...	Conon R.	560
Baginbun	R. Tay	810
Carnlough ...	Conon R.	450
,, ...	R. Tweed	615
Portbraddan ...	Cullen (Banffshire) ...	410
Donegal drift nets ...	R. Corrib	227
,, ...	R. Cashen	246
,, ...	L. Currane	270
,, ...	Glengariff R.	337

These results are illustrated diagramatically in Fig. 1.

In cases where the shortest distance between the place of tagging and the place of recapture is known and also the time at liberty we can calculate an apparent rate of travel. This is, of course, only a minimum rate because the fish do not travel in straight lines and the shortest distance between two places must frequently be considerably less than the actual distance travelled. Moreover we do not know how long a fish was at the place of recapture before being retaken, or whether it stopped one or more times on the route. In Table 5 the apparent rates of travel for those fish for which detailed information was available have been given. Only a small percentage of fish had apparent rates of travel exceeding 20 miles per day. The greatest speed recorded was for a fish from Achill which travelled to the place of recapture at a speed not less than 33 miles per day. The speeds recorded in these experiments were generally less than those recorded for Norway and Scotland. Nevertheless the results indicate that salmon can travel at fairly high speeds (up to 33 miles per day as a minimum) along the Irish coasts.

So much for the results as a whole. We might now examine the results from the individual tagging stations. Tagging of fish in the open sea off Achill was started in 1949 and was con-

Fig. 2.– Sketch map showing movements of salmon from Achill, Co. Mayo, in the years 1948 to 1950, inclusive. (Based on Went, 1951).

tinued there in the following two years. The main movements revealed by these investigations were to the north. To the south movements were, in the main, short (within 50 miles) whereas to the north some fish travelled long distances to the coast of County Antrim, to North Wales, to the west coast and even to one place on the east coast of Scotland (Fig. 2). In 1948 tagging operations were started at Baginbun and continued there until 1951. From this station salmon moved mainly towards the

south (or south and west) to the Rivers Suir, Nore, Barrow, Blackwater and Lee. Only a small proportion of the fish were recaptured in the River Slaney (Fig. 3). Only 2 long distance movements were recorded, mainly to the River Fane near Dundalk and to the River Tay on the east coast of Scotland.

A third tagging station was opened at Rath in 1950 and work continued there until the end of the 1953 season. The great majority of the fish tagged at Rath were recaptured in local rivers flowing into Kenmare Bay, and a small proportion were recaptured in rivers entering Bantry Bay. A few fish only

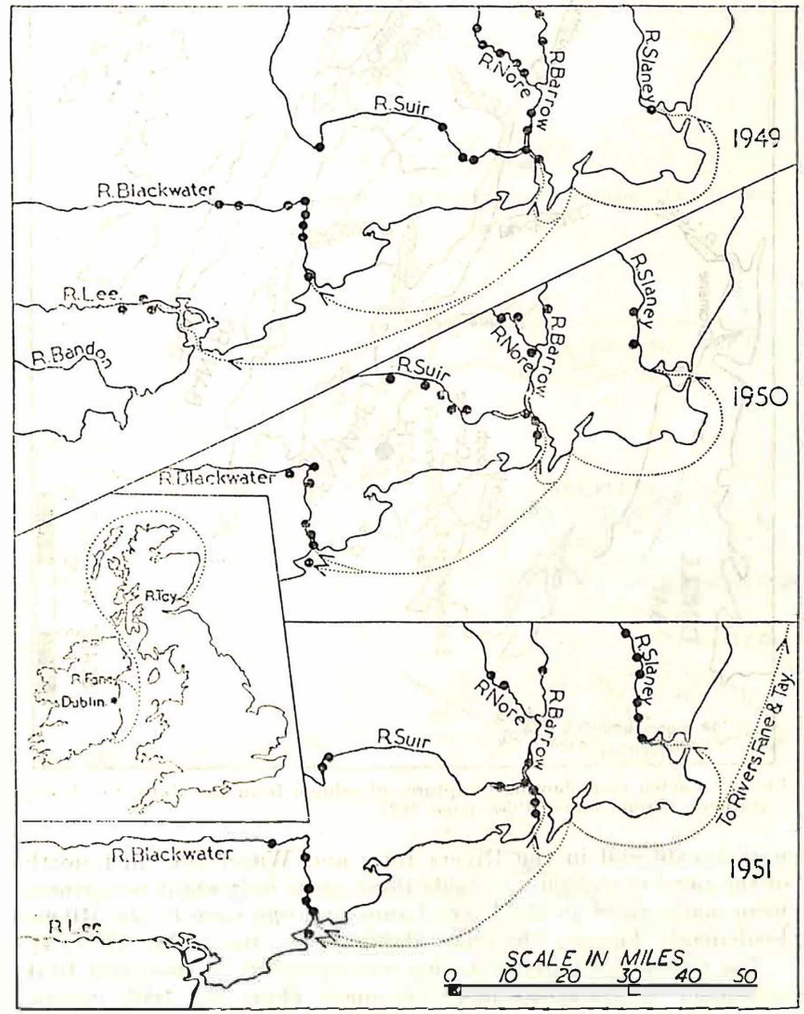


Fig. 3.—Sketch map showing recaptures of salmon from Baginbun, Co. Wexford. Inset shows long distance recaptures in the Rivers Fane and Tay. (From Gibson, 1953, page 197).

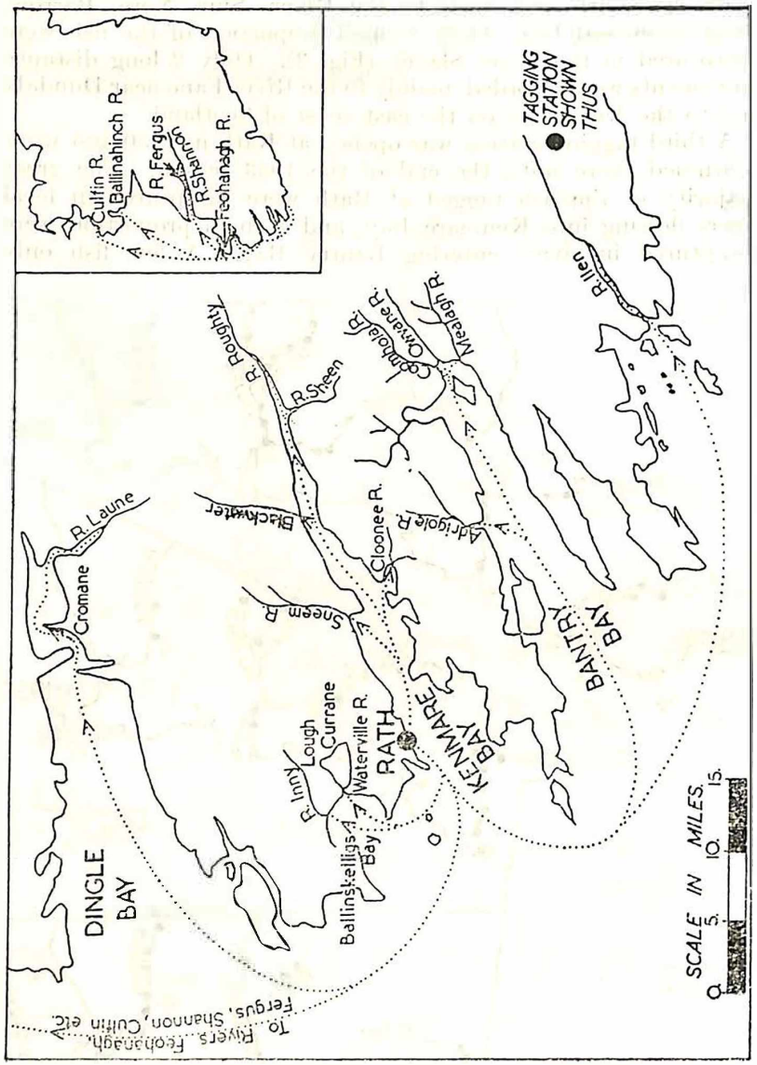


Fig. 4.—Sketch map showing recaptures of salmon from the Rath, Co. Kerry station. (From Toner, 1957, page 322).

were recaptured in the Rivers Inny and Waterville, just north of the tagging station. Outside these areas only eight recaptures were made, three in the River Laune and one each in the Rivers Feohanagh, Fergus, Shannon, Ballinahinch and Culfin (Fig. 4).

The Carnlough tagging station was operated in 1950 and 1951 and most of the recaptures were made along the Irish coasts, north and west of the tagging station. In each year recaptures were made on the south-west coast of Scotland and on the east coast of Ireland (Fig. 5). Two fish tagged in 1950 were retaken

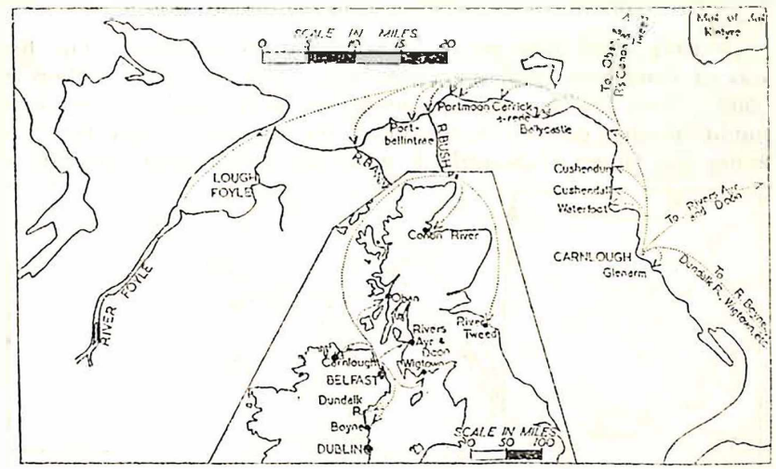


Fig. 5.—Sketch map showing recaptures of salmon from Carnlough, Co. Antrim. (Based on Went, 1953).

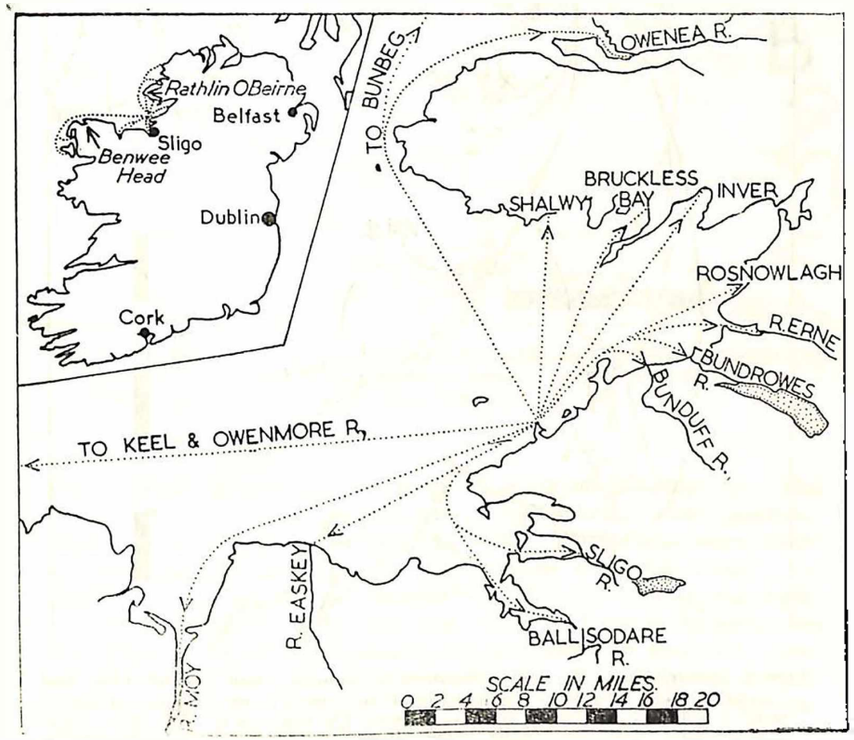


Fig. 6.—Sketch map showing recaptures of salmon from Streedagh, Co. Sligo. (From Went and Gibson, 1953, page 2).

on the east coast of Scotland in the Conon River and the River Tweed.

In 1951 three new tagging stations were started. The first was at Streedagh and operations were also carried on there in 1952. With few exceptions recaptures were made within what might be called greater Donegal Bay, for most of the fish travelling along the shore at Streedagh were obviously near the end of

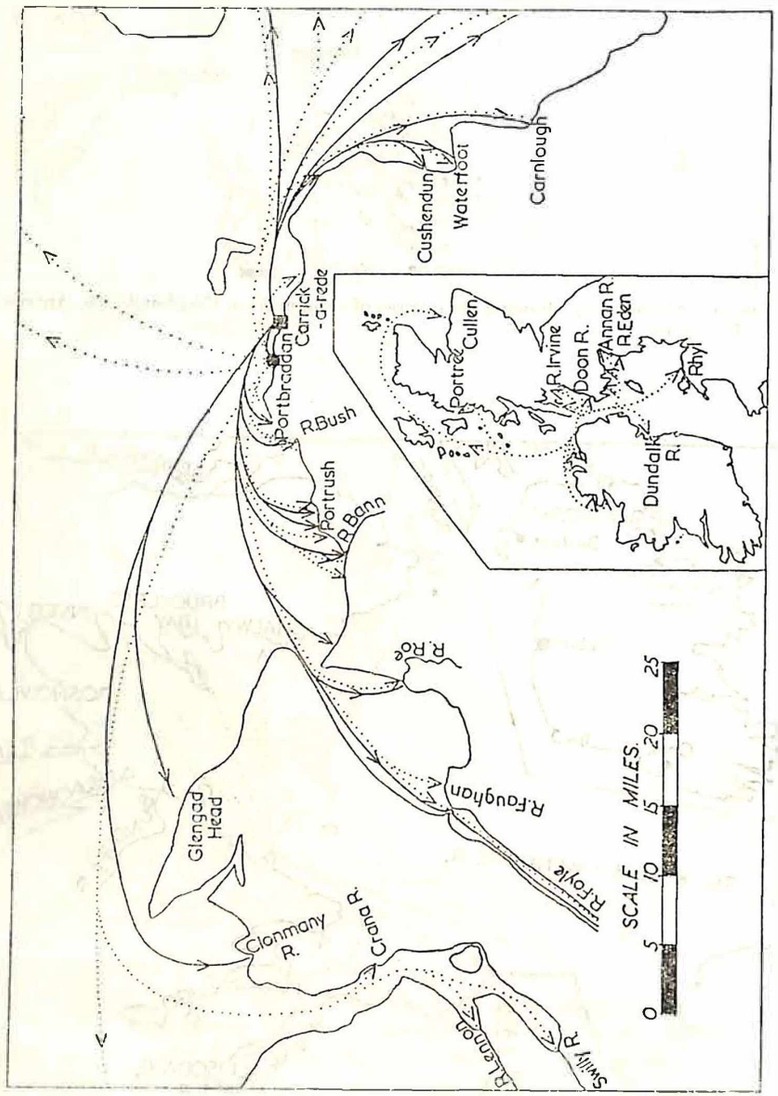


Fig. 7.—Sketch map showing recaptures of salmon from Portbraddan and Carrick-a-rede, Co. Antrim. (Based on Went and Vickers, 1953). (Routes from Portbraddan, dotted line, and from Carrick-a-rede, full line. The Portbraddan station shows as black circle, and Carrick-a-rede station as black square. In inset both stations have been combined for convenience).

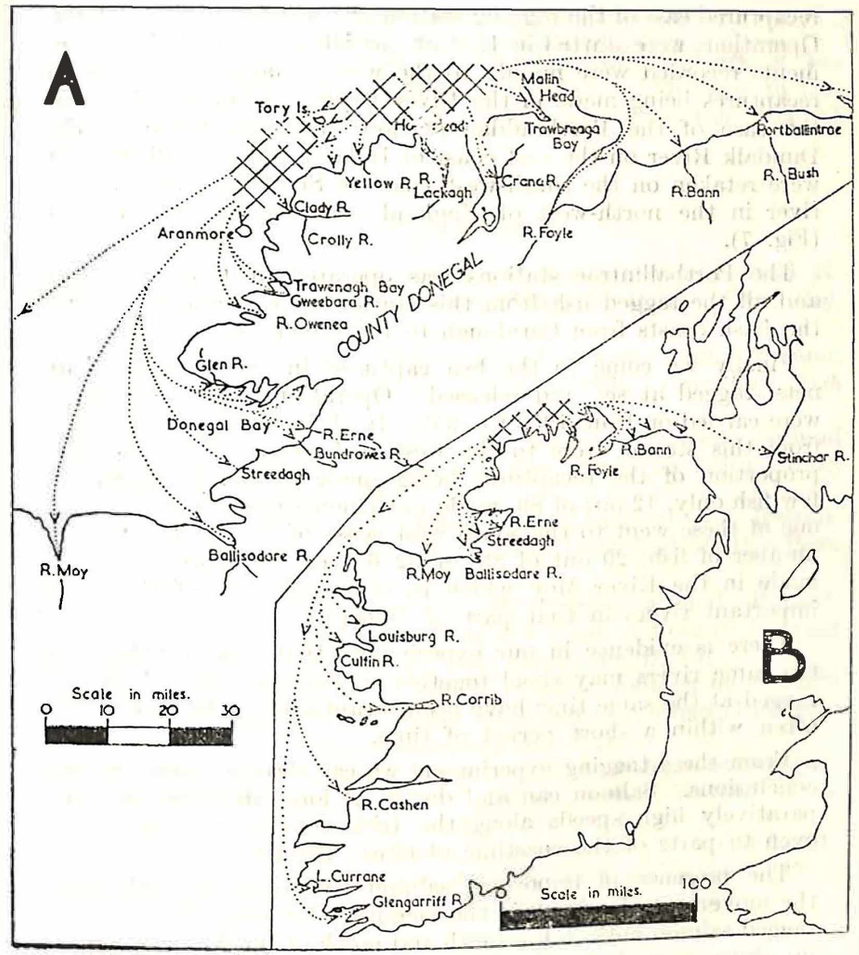


Fig. 8.—Sketch maps showing: A.—Local movements, and B.—Long distance movements of tagged salmon released from drift nets off the east of Co. Donegal. (From Went, 1958, page 208).

the return journey to the river of their origin (Fig. 6). The second station started in 1951 was at Portbraddan and operations were continued there in 1952 as well. Recaptures were made in large numbers along the Irish coasts from Carnlough, Co. Antrim to Kilcar in Co. Donegal. A single recapture was made in the Dundalk river on the east coast of Ireland, in rivers on the west coast of Scotland and at one place on the east coast, as well as at Rhyl, North Wales (Fig. 7). The Portrush station was operated in 1951 and the recaptures, with one exception, were all made to the west of the tagging station in the Rivers Bann and Foyle or their tributaries. Only a single fish was

recaptured east of the tagging station at Cushendall, Co. Antrim. Operations were started in 1951 at Carrick-a-rede and the movements recorded were mainly to the west, a large proportion of recaptures being made in the River Foyle. A single fish, as in the case of the Portbraddan station, was recaptured in the Dundalk River on the east coast of Ireland and a small number were retaken on the south-west coast of Scotland and one in a river in the north-west of England near the Scottish Border (Fig. 7).

The Portballintrae stations was operated in 1953 and 1954 and all the tagged fish from this station were recaptured along the Irish coasts from Carnlough to the River Foyle.

Finally we come to the fish captured in the Donegal drift nets, tagged at sea and released. Operations along this coast were carried on from 1953 to 1957. In the main the movements from this station were to the west and south (Fig. 8) a high proportion of the recaptures being made in Co. Donegal. A few fish only, 12 out of 89, made movements eastwards and only one of these went to the south-west coast of Scotland. A large number of fish, 29 out of 89, or 32·6% of the recaptures were made in the River Moy which is, of course, one of the most important rivers in that part of Ireland.

There is evidence in our experiments that fish travelling to the same rivers may shoal together in the open sea, since fish tagged at the same time have been recaptured in the same river often within a short period of time.

From these tagging experiments we can draw certain interim conclusions. Salmon can and do travel long distances at comparatively high speeds along the Irish coasts and from there even to parts of the coastline of Great Britain.

The presence of important salmon rivers greatly influences the movement of salmon in the vicinity. For example, we have tagged salmon both to the south and north of the River Moy and in all cases we have obtained a high proportion of recaptures from that river. Similarly the Foyle and Bann, the two great salmon rivers of the north of Ireland, have such an influence on salmon in that region that the predominant movements appear to be towards these rivers. This fact, no doubt, accounts for the predominantly westward movement of salmon recorded in our scientific work along the coast of County Antrim.

We have not, however, established any definite pattern of movements of salmon close inshore around Ireland which appear to be for the most part a question of trial and error. It seems that salmon move in from the open sea at many places along the Irish coasts and their movements, once they reach inshore waters, appear to be governed by the relationship between the place of impact on the coast and the situation of the parent river, for there is ample evidence from other work to suggest that fish regularly return to the river of their youth.

ACKNOWLEDGMENT.

The Minister for Lands acknowledges the courtesy of the Ministry of Commerce, Belfast, in agreeing to inclusion in this paper of material relating to experiments along the coast of Co. Antrim.

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TABLE 1.—Details of the taggings at the different stations with number and percentage of recoveries.

Tagging Station	Number of Fish Tagged	Number of Recoveries	Percentage Recovery
Achill	769	199	25·9
Baginbun	271	111	40·9
Carnlough	208	85	40·9
Streedagh	511	78	15·3
Portrush	81	35	43·2
Portbraddan	531	189	35·6
Carrick-a-rede	381	117	30·7
Portballintrae	220	52	23·6
Rath	494	119	24·1
Donegal coast drift nets ...	732	89	12·2
All Stations combined	4,198	1,074	25·6

TABLE 2.—Details of the method of recapture of tagged fish (excluding the Rath and Donegal drift net stations from which information is not available).

Tagging Station	Recaptures by					
	Draft Nets	Drift Nets	Bag Nets	Rod and Line	Other Methods	Total
Achill	132	12	5	32	4	185
Baginbun	34	26	—	16	32	108
Streedagh ...	64	1	2	3	1	71
Carnlough ...	41	3	26	8	4	84
Portrush	14	—	—	4	16	34
Portbraddan ...	116	4	20	16	25	181
Carrick-a-rede ...	63	5	21	16	10	115
Portballintrae ...	32	2	8	4	5	51
Total for all Stations	496	55	82	99	97	829
Percentage ...	59·9	6·6	9·9	11·9	11·7	100·0

TABLE 3.—Showing the number of days tagged fish from the different stations were at liberty.

Tagging Station	Days at Liberty						
	1–10	11–20	21–30	31–40	41–50	Over 50	Total
Achill	80	46	26	8	7	10	177
Baginbun ...	51	20	14	9	3	9	106
Carnlough ...	31	11	14	4	5	16	81
Streedagh ...	47	18	2	1	—	—	68
Portrush ...	21	8	1	3	—	1	34
Portbraddan ...	104	22	14	5	5	14	164
Carrick-a-rede ...	45	36	8	4	1	13	107
Portballintrae ...	Not available						
Rath	41	36	17	8	3	8	113
Donegal drift nets	41	27	6	3	1	7	85
All Stations combined ...	461	224	102	45	25	78	935
Percentage ...	49·3	24·0	10·9	4·8	2·7	8·3	100·0

TABLE 4.—Minimum distances in miles travelled by tagged fish.

Tagging Station	Distance Travelled							
	1–50	51–100	101–200	201–300	301–400	401–500	Over 500	Total
Achill	103	50	16	5	1	2	1	178
Baginbun	68	38	1	—	—	—	1	108
Carnlough	57	13	2	—	—	1	1	74
Streedagh	69	5	—	—	—	—	—	71
Portrush	30	5	—	—	—	—	—	35
Portbraddan	156	22	7	—	—	1	—	186
Carrick-a-rede	102	8	4	—	—	—	—	114
Portballintrae	52	—	—	—	—	—	—	52
Rath	110	5	4	—	—	—	—	119
Donegal drift nets ...	10	58	6	3	1	—	—	78
All Stations combined ...	757	204	40	8	2	4	3	1,018
Percentage	74·4	20·0	3·9	0·8	0·2	0·4	0·3	100·0

TABLE 5.—Showing the apparent rates of travel (speeds) in miles per day of tagged fish.

Tagging Station	Speed in Miles per Day							
	Up to 4·9	5·0–9·9	10·0–14·9	15·0–19·9	20·0–24·9	25·0–29·9	30·0–34·9	Total
Achill	99	43	14	10	4	2	1	173
Baginbun	65	26	13	1	1	1	—	105
Carnlough	57	11	3	—	—	1	—	72
Streedagh	56	8	1	2	—	—	—	67
Portrush	32	1	1	—	—	—	—	34
Portbraddan	90	46	26	1	—	—	—	166
Carrick-a-rede	76	18	9	—	—	—	—	103
Portballintrae	46	3	2	—	1	—	—	52
Rath	105	5	—	—	1	1	—	112
Donegal drift nets ...	29	30	9	6	1	—	—	75
All Stations combined ...	653	191	78	23	8	5	1	959
Percentage	68·2	19·9	8·1	2·4	0·8	0·5	0·1	100·0

APPENDIX No. 26.

RECENT TAGGINGS OF SALMON AND SEA TROUT KELTS

By

A. E. J. WENT, Inspector and Scientific Adviser,
Fisheries Division, Department of Lands.

In a previous paper (Went, 1947) a full account has been given of recapture of salmon kelts tagged at certain centres in Ireland since the beginning of this century and subsequently notes were given of a few additional results which had been obtained from 1949 to 1952 inclusive (Went and Gibson, 1953). Since the publication of the main paper in 1947, a number of other interesting results have been obtained. The present notes bring up to date the results of tagging of salmon and sea trout kelts from 1947 onwards, and they include those results already reported (Went and Gibson, 1953). It is not proposed to refer here to the results from the Burrishoole River system since the Salmon Research Trust of Ireland Incorporated has now taken over responsibility for all work in that area.

Altogether 5,208 salmon kelts and 1,185 sea trout kelts were tagged at Ballisodare, Co. Sligo; Banteer, Co. Cork; Glenties, Co. Donegal and Lismore, Co. Waterford, together with a few fish at Ballina, Co. Mayo. There were no recaptures from the Ballina taggings. Sea trout were tagged only at Glenties.

The numbers of fish tagged at the different centres in the different years are given in Table 1. Some recaptures can still be expected from those fish tagged in 1957 and possibly to a limited extent from earlier years, so that the numbers of recaptures may not be the final figures.

TAGGING AT GLENTIES, CO. DONEGAL (RIVER OWENEA).

(*a*) Salmon.—Number tagged = 1,823.
Number of recoveries of tags = 142 (99 as kelts and 43 clean fish).
Percentage recovery of clean fish up to the 31st of August, 1958 = 2·9%.

The distribution of the recoveries of clean fish was as follows:—River Owenea, 35; Donegal Bay, 3; Teelin Bay, Stag Sound, Aranmore, Bloody Foreland, 9 miles S.W. Tory Island and River Foyle, 1 each (see Fig. 1 and Table 2).

Average weight and length at tagging = 4·7 lb. and 24·8 inches.
Average weight and length at recapture = 11·0 lb. and 28·7 inches.
Percentage increase in weight and length = 134% and 16% respectively.

These figures agree fairly well with those already given for Ireland as a whole (Went, 1947). This means that every lb. of useless kelt was converted into 2·34 lbs. of good edible flesh.

(*b*) Sea trout.—Number tagged = 1,093.
Number of recoveries of tags = 16.
Percentage recovery up to 31st August, 1958 = 1·5%.

One tag was recovered from Portnablagh, Co. Donegal, where it was found on the beach and one was recovered from a live fish near Burtonport, Co. Donegal. Fourteen tags were recovered from fish in the River Owenea itself (Fig. 1). The small proportion of recoveries may be explained to some extent by the fact that owing to their small size, few sea trout are taken in nets. In fact most of the sea trout were recaptured by rod and line. The relative lengths and weights at release and recapture were as follows:—

Length = 14·2 inches and 17·3 inches respectively.
Weight = 17·2 ozs. and 29·8 ozs. respectively.

The percentage increases were, therefore, length, 22% and weight, 73%.

Tagging at Ballisodare, Co. Sligo (Ballisodare River).

Number of salmon kelts tagged = 313.
Number of recoveries up to 31st August, 1958 = 9 (6 kelts and 3 clean fish).

Recoveries of two clean fish were made in commercial nets in the outer estuary of the River Moy, well to the west of the Ballisodare River, and one tagged fish was recaptured in a drift net 2 miles north of Horn Head in Co. Donegal (Fig. 1 and Table 2). Four tagged fish (still as kelts) were also recaptured in the outer estuary of the River Moy in commercial nets and one tagged fish (still as a kelt) was recaptured in the estuary of the Sligo or Garavogue River (Table 2). The recaptures in the estuary of the Moy are interesting because we have already obtained evidence of the movement of clean fish in a contrary direction (Went, 1951). One of the tagged kelts travelled from Ballisodare to the Moy, a distance of at least 36 miles, in a single day. This is a remarkably good speed for a kelt and is of the same order as the maximum given for clean fish tagged at Achill (Went, 1951).

Tagging at Banteer, Co. Cork (River Blackwater).

Number of salmon kelts tagged = 2,151.
Number of recoveries up to 31st August, 1958 = 36 (16 from kelts and 20 from clean fish).
Percentage recovery of clean fish up to 31st August, 1958 = 0·9%.

With one exception all the recaptures were made in the Blackwater itself. The exception was a fish taken in a drift net at Knockadoon in the open sea about 4 miles south-west of the

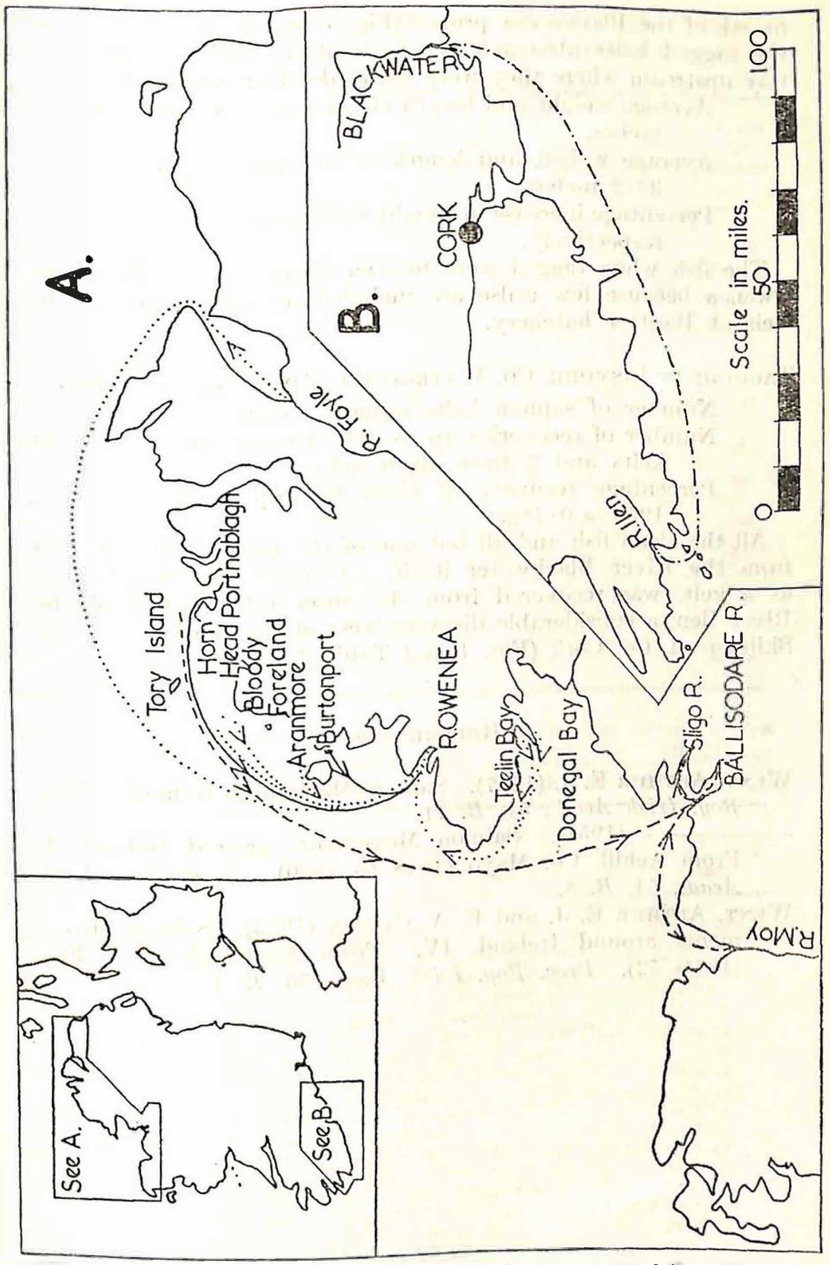

Fig. 1.—Sketch Map showing A. Movements of salmon (dotted line) and sea trout (full line) from the River Owenea and salmon (broken line) from the Ballisodare River, and B. Movement of salmon kelt from River Banteer to River Ilen.
(Inset map shows the portion of Ireland covered by A and B. Both A and B are on the same scale).

mouth of the Blackwater proper (Fig. 1 and Table 2). Some of the tagged kelts after release, particularly males, made their way upstream where they were found dead at a later date.

Average weight and length at tagging = 8·8 lb. and 28·3 inches.

Average weight and length at recapture = 13·0 lb. and 32·2 inches.

Percentage increase in weight and length = 48% and 14% respectively.

The fish when tagged were heavier than those of the River Owenea because few grilse are included in the catches at the weir at Banteer hatchery.

Tagging at Lismore, Co. Waterford (River Blackwater).

Number of salmon kelts tagged = 682.

Number of recoveries up to 31st August, 1958 = (6 from kelts and 3 from clean fish).

Percentage recovery of clean fish up to 31st August, 1958 = 0·4%.

All the clean fish and all but one of the kelts were recovered from the River Blackwater itself. A single tagged fish, still as a kelt, was recovered from the outer tidal waters of the River Ilen, a considerable distance west of the Blackwater near Skibbereen, Co. Cork (Fig. 1 and Table 2).

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Table 1.—Details of numbers of kelts tagged in the different years. (Except for Glenties all figures relate to salmon alone).

Year	Glenties		Banteer	Lismore	Ballisodare	Tramlaur	Moy	Totals for Salmon
	Salmon	Sea Trout						
1948 ...	—	56	211	25	—	—	—	236
1949 ...	70	53	—	—	55	—	24	149
1950 ...	—	20	176	6	—	—	—	182
1951 ...	162	102	354	33	44	50	—	643
1952 ...	106	252	272	160	40	14	—	592
1953 ...	170	25	110	—	54	27	—	361
1954 ...	287	—	220	—	—	82	—	589
1955 ...	115	254	408	235	42	6	—	806
1956 ...	408	184	152	120	39	32	—	751
1957 ...	505	147	248	107	39	—	—	899
Totals	1,823	1,093	2,151	686	313	211	24	5,208

Table 2.—Details of fish not recaptured in the river where tagging took place or its estuary. (See Fig. 1). All salmon except where indicated thus *, which are sea trout.

Release		Recapture	
River	Date	Place	Date
Owenea	9/1/51	Teelin Bay	5/7/51
,, ...	14/12/51	Doovin Rock (Donegal Bay) ...	15/7/52
,, ...	17/12/51	9 m. S.W. Tory Lighthouse ...	3/7/52
,, ...	18/12/52	Estuary, River Foyle	4/7/53
,, ...	9/1/53	Bloody Foreland Point ...	15/6/53
,, ...	14/12/51	St. John's Point (Donegal Bay)	13/6/56
,, ...	14/12/51	Bruckless (Donegal Bay) ...	6/7/55
,, ...	17/12/56	Sting Sound, Aranmore	29/6/57
,, *	4/12/52*	Portnablagh*	20/6/53
,, *	12/12/57*	Near Bartonport*	26/5/58*
Banteer	26/11/48	Knockadoon	17/7/52
Ballisodare	20/1/49	Estuary, River Moy	19/3/49†
,, ...	6/2/51	Estuary, River Moy	23/2/51†
,, ...	10/1/52	2 m. North Horn Head ...	13/6/52
,, ...	28/1/53	Estuary, River Moy	3/7/53
,, ...	26/1/53	Estuary, River Moy	23/6/53
,, ...	8/2/55	Sligo River	14/4/55†
,, ...	8/2/55	Estuary, River Moy	9/2/55†
,, ...	8/2/55	Estuary, River Moy	27/3/55†
Lismore	22/12/52	River Ilen near Skibbereen ...	26/2/53†

† Still as kelts.

APPENDIX No. 27.

TAGGING EXPERIMENTS IN THE RIVER SHANNON IN 1954, 1955 AND 1956

By

ANN HEWETSON, M.Sc., Fisheries Division,
Department of Lands.

An investigation into the movements of salmon around Ireland has been in progress since the year 1948. Clean salmon have been tagged at a number of stations off the Irish coast, and the results of their movements have been published in a series of papers (see references). In 1954, in conjunction with the Electricity Supply Board of Ireland, it was decided to investigate the movements of salmon in the estuary of the River Shannon. Arrangements were made for the capture of salmon, for tagging, by means of two stake nets, during the weekly close time. Salmon were tagged and immediately released in the estuary.

In 1954 two stake nets were operated, one at Rusheen (ca. 9° 21′ W., 52° 37′ N.), and one at Lacknabahee (ca. 9° 20′ W., 52° 36′ N.) (Fig. 1), on the north side of the estuary approximately 15 and 16 miles, respectively, from the mouth of the river. The nets were operated on seven week-ends during the months of May and June. In 1955 and 1956 two other stake nets were operated, at Long Rock and Kilcolgan, situated on the south side of the estuary. Long Rock (ca. 90° 16′ W., 52° 34′ N.) is approximately 18 miles and Kilcolgan (ca. 90° 28′ W., 52° 34′ N.) approximately 10 miles from the mouth of the river (Fig. 1). In 1955 these nets were operated on six week-ends from May to July, while in 1956 tagging was extended over a period of eleven week-ends from April to July.

The tag used in 1954 and 1955 was the Lea Hydrostatic tag (see Went, 1951). In 1956 a flat type of tag was used, consisting of a thin sheet of light cardboard made waterproof by a heavy coat of celluloid. A light strand of wire was fastened to one end by means of which the tag could be firmly attached at the base of the fin of the fish in the same manner as with the Lea tag. Each tag bore a serial number, and the following inscription :—

> " Send this tag to Dept. of Agriculture (Fisheries Branch), Dublin, stating when and where caught, gear used, length and weight of fish. Send also about 100 scales scraped from shoulder of fish. A reward of 5s. will be paid for this tag ".

As each fish was tagged its length was recorded.

Rusheen, 1954.—A total of 208 fish were tagged at Rusheen during the months of May and June. Table I gives the dates of tagging and the numbers of fish tagged on each date. The

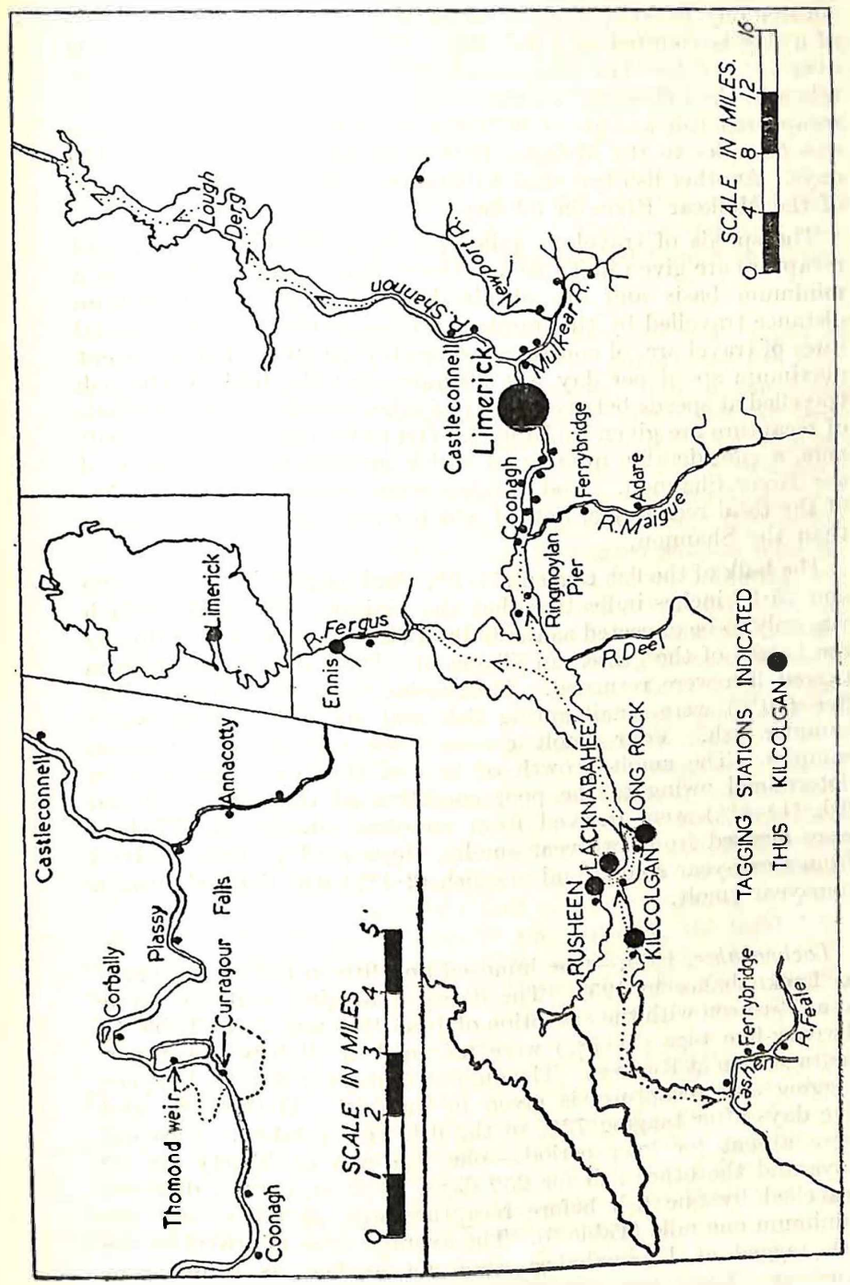

FIG. 1.

percentage return was 24·5%. The number of days at liberty (in five day periods) is given in Table 2. For this purpose part of a day is counted as a full day. Within five days of tagging over 78% of the fish were recaptured and a further 9·8% were taken in the following five days. The distances travelled by the recaptured fish are given in Table 3. The maximum distance was 63 miles to the Mulkear River travelled by one fish in 116 days. Another fish travelled a distance of 46 miles to a tributary of the Mulkear River in 32 days.

The speeds of travel, in miles per day, between tagging and recapture are given in Table 4. These figures are calculated on a minimum basis and are obtained by dividing the minimum distance travelled by the number of days at liberty. The actual rates of travel are, of course, considerably greater. The apparent maximum speed per day was 30 miles and the bulk of the fish travelled at speeds between 5 and 15 miles per day. The methods of recapture are given in Table 5. Over 60% were taken in drift nets, a considerable number of which operate in the estuary of the River Shannon. Rod catches were responsible for 15·7% of the total recaptures, half of which were taken in rivers other than the Shannon.

The bulk of the fish tagged (77·9%) had lengths between 19·95 and 25·95 inches indicating that the majority were grilse which was only to be expected as the bulk of the fish were tagged during the height of the grilse run (Table 6). Fifty sets of scales from tagged fish were returned. Thirty-nine fish (78%) were grilse, five (10%) were small spring fish and six (12%) were small summer fish. Four smolt classes were represented in these samples. The smolt growth of two of the fish could not be determined owing to the poor condition of the scales. Seven fish (14·6%) were derived from one-year smolts, 37 (77·1%) were derived from two-year smolts, three (6·2%) were derived from three-year smolts and one fish (2·1%) was derived from a four-year smolt.

Lacknabahee, 1954.—One hundred and fifteen fish were tagged at Lacknabahee in 1954. The dates of tagging were the same as at Rusheen with the exception of June 19th and 26th (Table 1). Twenty-five tags (21·7%) were returned, a slightly lower percentage than at Rusheen. The number of days at liberty, between tagging and recapture, is given in Table 2. Within the first five days after tagging 72% of the fish were retaken. Two fish were absent for long periods—one fish was at liberty for 89 days and the other fish for 250 days. The maximum distance travelled by one fish before recapture was 45 miles, and the minimum one mile (Table 3). The average rates of travel of the fish tagged at Lacknabahee were not as fast as those from Rusheen. Forty per cent. of the fish travelled at speeds up to five miles per day, whilst 24% travelled between five and ten miles per day. Thirty-six per cent. of the tagged salmon were

recaptured in drift nets and 28% from Thomond Weir. Of the five rod and line recaptures only two were taken in the Shannon. Again the bulk of the fish tagged (70·5%) were grilse having lengths between 19·95 and 25·95 inches (Table 6). Twenty-three sets of scales were examined for age determination. Twenty-one fish (91·3%) were grilse, one was a small spring fish and one a small summer fish. The smolt growth of one fish could not be determined owing to the poor condition of the scale. Three smolt classes were represented; two fish (9·1%) were derived from one-year smolts, 19 fish (86·4%) were derived from two-year smolts, and one fish (4·5%) was derived from a three-year smolt.

Long Rock, 1955 *and* 1956.—The number of fish tagged at Long Rock in 1955 was small (Table 1). Ninety-one fish were tagged and 15 tags (16·5%) were recovered. This is one of the smallest percentage recoveries to date. In 1956 190 fish were tagged at Long Rock (Table 1) and 60 tags (31·6%) were recovered. The average percentage recovery for the two years therefore was 26·7%. As the results from the two years were similar it is proposed to deal with them together. Within the first five days of release 73·3% of the tagged salmon were recaptured, and a further 6·7% were taken in the following five days (Table 2). One fish was at liberty for 122 days (having travelled 37 miles to the Mulkear River). The maximum distance travelled by a fish was 89 miles to the River Camcor where it was retaken at Birr, 37 days after tagging. Over 33% of the remaining recaptures travelled distances between 25–29·9 miles (Table 3), but apart from this the average distances were comparatively short. Most of the fish were recaptured before they had reached Limerick city. The rates of travel were comparatively high (Table 4). Twenty-four per cent. travelled at speeds up to five miles per day, while 34·7% travelled between five and ten miles per day and over 26% between ten and fifteen miles per day. Approximately half of the recaptures, 36 fish, were taken in drift nets (Table 5) thus bringing the total drift net recaptures, for the three years, to just over 48%. Over 20% of the total catch were taken at Thomond Weir, while 16·5% were taken with rod and line. A further 5·7% were taken in stake nets and 5·1% in draft nets.

Again the bulk of the fish tagged (81·6%) had lengths between 19·95 and 25·95" (Table 6). Sixty-four sets of scales were returned and used to determine the age of the fish. Of these four fish (6·2%) were derived from one-year smolts, 58 (90·7%) were derived from two-year smolts and two (3·1%) from three-year smolts. Sixty-two fish (96·9%) were grilse, there was one small spring fish and one small summer fish.

Kilcolgan, 1955 *and* 1956.—In 1955 31 fish were tagged at Kilcolgan (Table 1) and four tags (12·9%) were recovered. In 1956 15 fish were tagged there (Table 1) and three tags (20%)

were recovered. These figures are too small to give any worthwhile results, therefore, it is not proposed to discuss the subject here other than giving the details of each recapture (Tables 2–7).

Discussion of Results.—The percentages of tags recovered were smaller than those recorded in most of the other tagging experiments undertaken in Ireland. In the River Foyle a return of 22·6% and 39·5% was obtained from two different tagging stations in 1954 and a return of 34·7% and 28·9% in 1955 (Went and Vickers, 1955, 1956). A higher percentage return was also obtained in most of the experiments carried on around the Irish coast. A return of 42% was obtained as a result of a tagging programme off Carnlough, Co. Antrim, in 1950 (Went, 1953) and Gibson, (1953) recorded a return of 41% for the three years 1949–1951, from Baginbun, Co. Wexford. Went and Vickers (1953) got a return of 31·5% from Portbraddan, off the Co. Antrim coast, in 1951 and 36·6% in 1952. Smaller percentages, however, were obtained during tagging experiments at Rath, Co. Kerry and Streedagh, Co. Sligo. In the former instance Toner (in press) got a return of 22·5% over a period of four year's tagging from 1950–1953 and in the latter, Went and Gibson (1953) recorded a return of 20·6% in 1951 and 5·4% in 1952.

The speeds of travel were fast, the bulk of the fish, i.e. 60·8% of those tagged at Rusheen, 40% of those tagged at Lacknabahee and 61·4% of those tagged at Long Rock, travelling at speeds between five and fifteen miles per day. These rates of travel compare favourably with those recorded from tagging experiments off the coast of Achill (Went, 1951). They are, however, considerably greater than the speeds recorded for fish tagged in the River Foyle, off the coast of Co. Antrim and Co. Sligo (op. cit.) where the bulk travelled at speeds up to five miles per day. These results from the Shannon indicate that salmon travel upstream with considerable speed.

The different areas in which recaptures were made are illustrated in Fig. 1. Each small black dot represents one or more fish retaken in that stretch of the river. The individual places of recapture are given in Table 7. The majority of the fish (approximately 76%) were retaken in the River Shannon. Just over half of these (52·5%) were recaptured in the river near Coonagh, where there is an intensive drift net fishery. A proportion of the fish, tagged on the second day of the weekly close season, would not have passed this area before commercial fishing was resumed at 6 a.m. on Monday morning. Just over 20% of the total recaptures were made at Thomond Weir.

Tags were returned from two of the major tidal tributaries of the Shannon, the Rivers Fergus and Maigue. Approximately 9% of the recaptures in the three years were made in the River Fergus. Three fish were retaken in the River Maigue. Five fish moved out of the estuary of the Shannon and travelled

south along the coast entering the River Feale. Four of these fish were tagged at Kilcolgan. One fish, tagged at Long Rock, was recaptured at the Kilcolgan stake net on the day following tagging. This fish was travelling westwards. Just over 7% of the total recaptures were made in the River Mulkear and its tributaries. Finally one fish travelled directly upstream through Lough Derg and entered the River Camcor, where it was retaken at Birr.

SUMMARY.—Salmon were tagged and released from four stake nets in the estuary of the River Shannon in the years 1954, 1955 and 1956 (Table 1). In 1954 the stake nets operated were Rusheen (ca. 9° 21′ W., 52° 37′ N.) and Lacknabahee (ca. 9° 20′ W., 52° 36′ N.). In 1955 and 1956 the stake nets operated were Long Rock (ca. 9° 16′ W., 52° 34′ N.) and Kilcolgan (ca. 9° 28′ W., 52° 34′ N.) (Fig. 1). The percentages of fish recaptured were as follows:—

In 1954—21·7% (Lacknabahee) and 24·5% (Rusheen).
In 1955—12·9% (Kilcolgan) and 16·5% (Long Rock).
In 1956—20·0% (Kilcolgan) and 31·6% (Long Rock).

The bulk of the fish were recaptured within five days of tagging (Table 2). The distances travelled were comparatively short. There was one long migration, a fish which travelled 89 miles (Table 3). The rates of travel were fast, the bulk of the fish travelled between five and fifteen miles per day (Table 4). Over 48% of the total recaptures for the three years were taken in drift nets (Table 5). The bulk of the fish tagged were grilse (Table 6).

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TABLE 1.—The dates of Tagging and the Numbers of Fish Tagged on each date.

1954			1955			1956		
DATE	NUMBER OF FISH TAGGED		DATE	NUMBER OF FISH TAGGED		DATE	NUMBER OF FISH TAGGED	
	Rusheen	Lacknabahee		Long Rock	Kilcolgan		Long Rock	Kilcolgan
May 15 ..	4	8	May 28 ..	—	1	April 28 ..	1	1
,, 16 ..	4	4	,, 29 ..	4	3	,, 29 ..	2	1
,, 22 ..	10	4						
,, 23 ..	9	12	June 4 ..	3	1	May 5 ..	8	—
,, 29 ..	9	1						
			,, 5 ..	1	6	,, 6 ..	7	—
,, 30 ..	4	3	,, 11 ..	2	3	,, 12 ..	1	—
			,, 12 ..	34	—	,, 19 ..	11	—
June 5 ..	14	2						
,, 6 ..	12	19	,, 13 ..	4	—	,, 26 ..	23	—
,, 7 ..	18	5	,, 18 ..	2	—	,, 27 ..	5	4
,, 12 ..	24	22	,, 19 ..	—	2	,, 28 ..	5	1
,, 13 ..	5	4	,, 25 ..	6	8	June 3 ..	5	—
,, 19 ..	1	—	,, 26 ..	26	—	,, 4 ..	2	2
,, 20 ..	17	5	,, 27 ..	4	3	,, 9 ..	3	—
,, 21 ..	6	3	July 2 ..	1	—	,, 10 ..	16	
,, 26 ..	34	—	,, 3 ..	4	4	,, 16 ..	18	—
,, 27 ..	37	23				,, 17 ..	3	1
						,, 23 ..	29	—
						,, 24 ..	29	4
						,, 30 ..	11	1
						July 2 ..	2	—
						,, 7 ..	12	—
						,, 8 ..	5	—
TOTAL ..	208	115	TOTAL ..	91	31	TOTAL ..	190	15

TABLE 2.—The Number of Days between Tagging and Recapture given in Five Day Periods (excluding three fish as the time of recapture is unknown).

Number of days	Rusheen (1954)		Lacknabahee (1954)		Long Rock (1955 and 1956)		Kilcolgan (1955 and 1956)	
	No.	%	No.	%	No.	%	No.	%
1— 5 ..	40	78·43	18	72·0	55	73·3	6	85·7
6—10 ..	5	9·81	1	4·0	5	6·7	—	—
11—15 ..	1	1·96	—	—	3	4·0	1	14·3
16—20 ..	1	1·96	2	8·0	2	2·7	—	—
21—25 ..	—	—	—	—	3	4·0	—	—
26—30 ..	1	1·96	—	—	—	—	—	—
31—35 ..	1	1·96	1	4·0	1	1·3	—	—
36—40 ..	—	—	—	—	2	2·7	—	—
58 ..	—	—	—	—	1	1·3	—	—
89 ..	—	—	1	4·0	—	—	—	—
105 ..	1	1·96	—	—	—	—	—	—
116 ..	1	1·96	—	—	—	—	—	—
122 ..	—	—	—	—	1	1·3	—	—
250 ..	—	—	1	4·0	—	—	—	—
TOTAL ..	51	100·00	24	96·0	73	97·3	7	100·0

TABLE 3.—Showing the Distances Travelled by Tagged Salmon (excluding five fish tagged at Long Rock, the time of recapture of four is unknown, whilst one fish was retaken in the stake net).

Distance Travelled in Miles	Rusheen (1954)		Lacknabahee (1954)		Long Rock (1955 and 1956)		Kilcolgan (1955 and 1956)	
	No.	%	No.	%	No.	%	No.	%
Up to 4·9 ..	—	—	4	16·0	—	—	1	14·3
5— 9·9 ..	2	3·9	—	—	1	1·3	1	14·3
10—14·9 ..	—	—	—	—	—	—	—	—
15—19·9 ..	—	—	—	—	4	5·4	3	42·8
20—24·9 ..	—	—	—	—	26	34·7	1	14·3
25—29·9 ..	25	49·0	9	36·0	25	33·3	—	—
30—34·9 ..	18	35·3	7	28·0	6	8·0	—	—
35—39·9 ..	3	5·9	2	8·0	4	5·4	1	14·3
40 or over ..	3	5·9	3	12·0	4	5·4	—	—
TOTAL ..	51	100·0	25	100·0	70	93·5	7	100·0

TABLE 4.—The Calculated Minimum Speed between Tagging and Recapture given in Miles per Day (excluding six fish as the time of their recapture is unknown).

Miles per day	Rusheen (1954)		Lacknabahee (1954)		Long Rock (1955 and 1956)		Kilcolgan (1955 and 1956)	
	No.	%	No.	%	No.	%	No.	%
Up to 4·9 ..	10	19·6	10	40·0	18	24·0	3	42·8
5—9·9 ..	19	37·3	6	24·0	26	34·7	2	28·6
10—14·9 ..	12	23·5	4	16·0	20	26·8	—	—
15—19·9 ..	5	9·8	1	4·0	2	2·7	2	28·6
20—24·9 ..	—	—	—	—	3	4·0	—	—
25—29·9 ..	3	5·9	3	12·0	1	1·3	—	—
30—34·9 ..	2	3·9	—	—	—	—	—	—
TOTAL ..	51	100·0	24	96·0	70	93·5	7	100·0

TABLE 5.—The Methods of Recapture.

Gear used in Recapture	Number of Recoveries				Total Number	
	Rusheen (1954)	Lacknabahee (1954)	Long Rock (1955 & 1956)	Kilcolgan (1955 & 1956)	No.	%
Drift Nets	31	9	36	1	77	48·7
Draft Nets	4	—	—	4	8	5·1
Stake Nets	2	4	2	1	9	5·7
Thomond Weir	6	7	19	1	33	20·9
Rod and Line	8	5	13	—	26	16·5
Fish Pass	—	—	1	—	1	0·6
Unknown	—	—	3	—	3	1·9
Found Dead	—	—	1	—	1	0·6
TOTAL	51	25	75	7	158	100·0

TABLE 6.—The Size Distribution of the Fish Tagged.

Size in inches	Rusheen (1954)	Lacknabahee (1954)	Long Rock (1955 & 1956)	Kilcolgan (1955 & 1956)
	%	%	%	%
16—17·9 ..	0·5	—	—	—
18—19·9 ..	1·4	—	2·8	4·3
20—21·9 ..	12·5	8·7	18·2	13·2
22—23·9 ..	41·4	33·9	43·1	41·3
24—25·9 ..	24·0	27·9	20·3	17·4
26—27·9 ..	7·2	6·9	4·6	4·3
28—29·9 ..	5·8	8·7	6·8	6·5
30—31·9 ..	4·3	12·1	2·3	8·7
32—33·9 ..	1·9	0·9	1·1	4·3
34—35·9 ..	0·5	0·9	0·6	—
36—37·9 ..	0·5	—	—	—
TOTAL ..	100·0	100·0	100·0	100·0

TABLE 7.—The Distribution of Recoveries (excluding four fish as the place of recapture is unknown).

Place of Recapture of Tagged Salmon	Salmon Tagged at Rusheen (1954)		Salmon Tagged at Lacknabahee (1954)		Salmon Tagged at Long Rock (1955 & 1956)		Salmon Tagged at Kilcolgan (1955 & 1956)	
	No. of Recoveries	Distance from Rusheen in Miles	No. of Recoveries	Distance from Lacknabahee in Miles	No. of Recoveries	Distance from Long Rock in Miles	No. of Recoveries	Distance from Kilcolgan in Miles
River Fealo	1	25	—	—	—	—	4	18—21
KILCOLGAN	—	—	—	—	1	8	—	—
RUSHEEN	—	—	2	1	—	—	1	6
Turbert	—	—	—	—	—	—	1	4
LACKNABAHEE	—	—	—	—	—	—	—	—
LONG ROCK	2	5	2	4	1	—	—	—
River Fergus	8	20	3	28	3	24	—	—
Ringmoylan Pier	—	—	—	—	2	18	—	—
Coonagh	25	24—34	6	26—29	30	19—25	—	—
River Maigue	3	31—37	—	—	—	—	—	—
Thomond Weir	7	31	7	33	19	29	1	37
Corbally	—	—	—	—	2	31	—	—
Plassy	2	39	2	38	5	34	—	—
River Shannon (Castleconnell) ..	—	—	—	—	2	36—38	—	—
Mulkear River	3	42—63	2	40	4	37—45	—	—
Tributaries of Mulkear	1	46	1	45	1	44	—	—
River Camcor	—	—	—	—	1	89	—	—
TOTAL ..	54	—	25	—	71	—	7	—

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